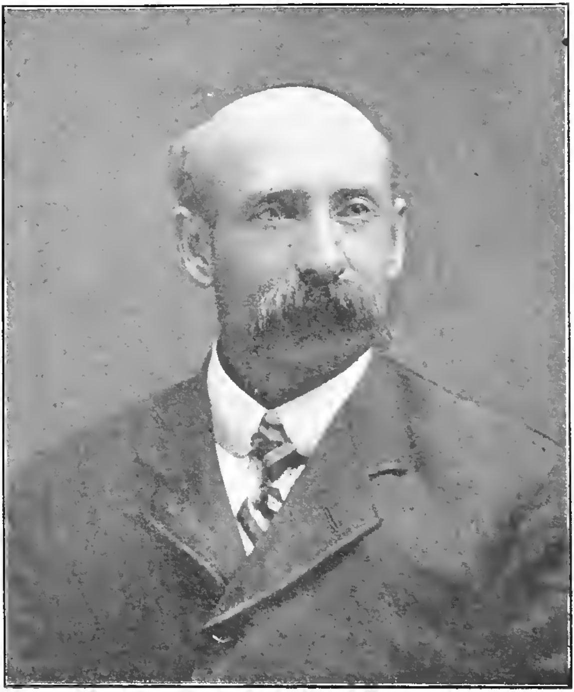
Seager Wheeler's Book

"Profitable Grain Growing"

Seager Wheeler



SEAGER WHEELER.

SEAGER WHEELER'S BOOK

ON

PROFITABLE GRAIN GROWING

BY

SEAGER WHEELER

WITH BIOGRAPHICAL SKETCH
BY
HOPKINS MOORHOUSE
AUTHOR OF "DEEP FURROWS"

THE GRAIN GROWERS' GUIDE, LIMITED
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INTRODUCTION

As a grower of prize-winning wheat, oats and barley, Seager Wheeler holds a record unequalled in the world to-day. His winnings in the past seven years have made his name a household word throughout Canada and the United States. His correspondence has been enormous, inquiries coming not only from these two countries, but from every part of the grain-growing world. All are anxious to learn his secret.

The secret of Seager Wheeler's success is twenty-five years of careful study and mighty hard work. In that long period of time he has discovered the secrets which Mother Nature stands ready to reveal to every student. He has mastered the problem of growing a big crop of high-class grain every year, no matter whether the rainfall be heavy or light. The only enemy he has yielded to is hail.

In response to thousands of earnest requests, Mr. Wheeler has written this book containing the results of his years of study. He says himself that the information in this book would have been worth $1,000 to him ten years ago. He feels that it will be helpful to thousands of other farmers who are struggling with the same problems that have confronted him. It will answer the endless inquiries that come to him in every mail and which he finds it physically impossible to answer. He

has written it with the hope that it will help to bring greater prosperity and happiness to his fellow farmers on these great fertile plains of Western Canada. If it accomplishes that purpose in some degree he will be abundantly satisfied.

THE PUBLISHERS.

Winnipeg, January, 1919.

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BY

HOPKINS MOORHOUSE

Author of "Deep Furrows")

SEAGER WHEELER:
CHAMPION GROWER OF GRAIN

I

The man with the tapeline stepped back and saluted. The British naval officer in charge looked up from the figures and slowly shook his head.

"Sorry, Admiral," he said kindly as he eyed the eager, cherry-cheeked lad who stood before him, "but it is not to be. Up and down you are one inch short, and round about there's another inch missing. Next."

The boy put on his cap—across the front of which "W. H. Smith & Sons" stood out in gold braid—and slowly went back to the news stand where for five years he had worked and waited for a chance to join the Navy. His failure to squeeze past the barrier of minimum physical measurements which Her Majesty had seen fit to erect was a great disappointment. The inch "up and down" might be accomplished, perhaps, by getting one of his chums to hit him on top of the head with the butt-end of an oar, thereby raising a lump an inch high. The "round-about" difficulty was not so easily overcome; in fact, there appeared to be no way of pumping enough additional air into his lungs or of keeping it in if he had to answer questions while being remeasured. No, it was not to be.

By such narrow margins—an inch up and down, or round about—do the destinies of men swing Life's Compass from pole to pole. But for the missing inch we might have been reading in the newspapers not long ago about the daring exploit of Commodore Seager Wheeler, of *H.M.S. Nameless,* at Zeebrugge, where, though severely wounded, he carried on and won the Victoria Cross. Instead, we read such headings as: "Seager Wheeler, Western Canada's Wheat King, Wins World's Championship for 5th Time."

It would be difficult to find two such great wins as these farther apart in environment and training. Bridging the breach between that boyhood ambition and the manhood accomplishment must stretch through the years a lifetime of effort—a rugged trail marked by milestones of failure, disappointment, dogged British pluck and final Success. This way lies our story.

On the rockbound coast of the Isle of Wight, within sound of the waves which for seventy-five feet climbed the cliffs of Chale Bay, stood a fisherman's cottage. Here it was that Seager Wheeler first opened his eyes. It was a strange interior indeed. From the rafters hung ship's cable, fishing nets, boathooks, sea-boots, oilskins and sou'-westers, lobster traps, ship's lanterns—all the equipment of those who seek a living from the sea; in the corners was stowed all manner of sea "junk", the accumulations of three generations. Many of these relics would have been counted of great worth by a collector, but were taken at face value by the simple fisher folk. Thus the old grandfather's clock told time in its present surroundings with the same calm unconcern which it had preserved through earlier and more stirring scenes—

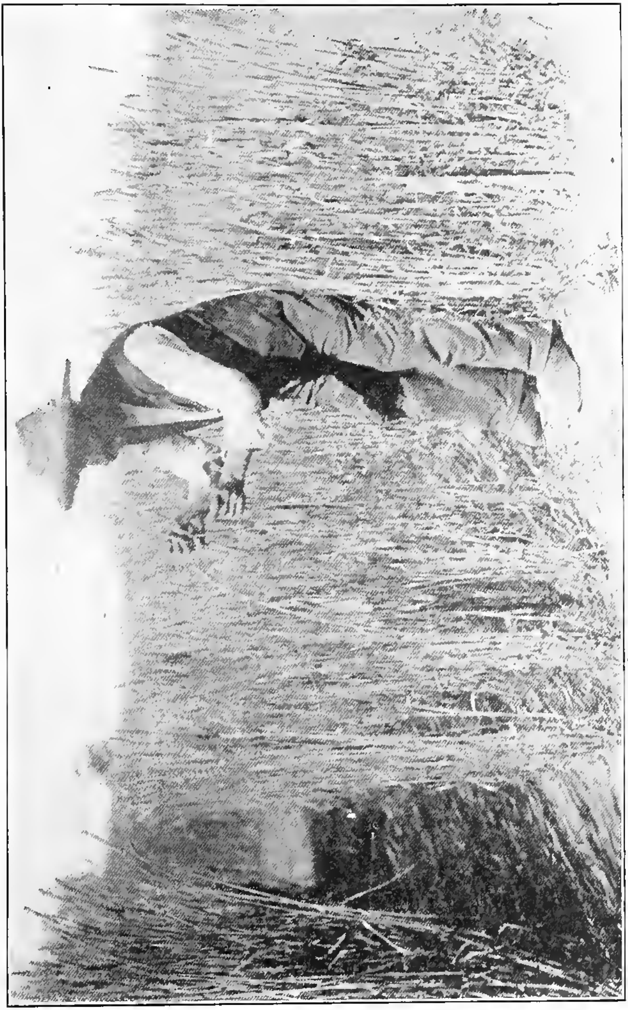


Fig. 1.—Seager Wheeler at Work on His Seed Plots.

troublous days which had left its ancient teakwood scarred by bullet-marks.

The place was called Blackgang—so named after a gang of bold smugglers who once infested the locality, flashing their signal lights seaward on dark nights and running contraband ashore through underground passages into secret caves.

"The boy will be born on my birthday," said Great Grandmother Seager. "Aye, 'twill be a boy. Aye, 'twill."

The prophecy came true—in 1869—and they named him "Seager" for the pleasure it would give the very, very old lady. What's in a name? Some significance, surely; for the meaning of "Seager" is conqueror, victor.

An Atmosphere of Romance

The boys called him "Sig" for short, and when the family moved to Ventnor, along the coast, there began for him a boyhood such as few boys are privileged to know. The atmosphere in which he lived was steeped with the flavors of Romance and Adventure. Beating homeward from the Seven Seas passed all types of vessels, laden with the cargoes of world commerce and manned by hairy-chested British tars who were fresh from strange adventures in foreign lands.

Thereabouts the coast was rich in the lore of past events. Sunk deep in the sands of the ocean bed were countless wrecks of by-gone days; for it was a coastline of dangerous shoals and rugged cliffs and tide rips. In times of storm, when tumbling waters raged in from the open sea to crash and seethe and hiss against those cliffs, it was impossible to launch a lifeboat off Blackgang. Not far away, black and ragged, the Atherfield Rocks loomed

from the boiling seas and once afoul of these a vessel was doomed.

So in the sands, sunk deep, the relics of many a buried tragedy aged. When the waves had washed deep after a bad storm, some of these ancient relics came to light. From this source was gathered the "junk" of the fisher cottages. The young Wheelers found old pistols, cutlasses—all manner of things which they delighted in digging from the sands. Once Seager's brother found an old coin of Cromwell's time, surrounded by petrified stone which the boys broke off; it was a big day when they sold the coin for one pound sterling.

Picking up coins was no unusual experience in the neighborhood. In fact, there was one place of blackish sand where coins were found so frequently that it was named "the Money Hole." Bullion also, from wrecked treasure ships of early days, was fished out of those waters sometimes by fishermen who discovered it through their glass-bottomed "peep-tubs" by means of which they were able to see down into the water to the ocean bed. It was known, too, that at least one of the great galleons of the Spanish Armada had gone down off that coast; for its guns had been partially uncovered by storms and had been seen on several occasions by the fishermen before other storms reburied the historic tokens.

Cast up by the Sea

Treasure trove was regarded by the fisher folk as their right, the Government's claim notwithstanding. There was scarcely a cottage along that coast that did not have in store some supplies which had washed in from the sea. So strong was tradition that even the coastguards now and then turned away their eyes when the people sallied

forth to help themselves to the gifts of the sea. One time the beach would be strewed with cocoanuts after a storm, the cargo of some tramp freighter from southern waters, wrecked over night. Again, it would be cases of oranges which came bobbing in over the waves; or sacks of flour, encrusted on the outside but still good flour in the centre of the sack; or cases of corned beef. Once a piano from the saloon of a passenger steamer beached itself neatly and upon it, to the great delight of a crowd of boys and girls, lanky Benny Hobbs played "Ben Bolt" very touchingly, the surf chiming in with monotonous obligato.

Now and then the life of the community was stirred by events which had their beginning in faint cries for help out of black, spume-driven nights or the blue streak of a distress rocket—events which ended in bold rescues or tragic failures. The hardy fishermen frequently risked their lives gladly to rob the sea of its prospective victims; but there were times when even their recklessness was without avail. The men of the Wheeler family, known all along the coast for their daring skill in such work, had to their credit a long list of lives saved. While for many of these they received no public recognition, there were many deeds which did bring rewards. From Seager's great-grandfather down—his grandfather, his father, his uncles—stretched a string of life-saving medals. Medals seemed to run in the family as a matter of course.

It was very difficult to get these men to talk of their achievements; but what stories they could tell over their pipes to the wide-eyed youngsters!—stories of wild danglings at the ends of ropes by which they were lowered from the tall cliffs to where helpless vessels were dashing

to pieces against the rocks below—close in; for the water was deep inshore. Dangerous business, these rescues; but their own peril was the last thought of these fishermen.

The Rescue of Lord Yarborough

The boy, Seager, liked to hear of the double rescue of Lord Yarborough by Great-Grandfather Wheeler, who had served one time on his lordship's yacht. While a member of the crew, John Wheeler had dove recklessly from a yard-arm into a rough sea to save the owner's life, he having fallen overboard and being in dire straits. Years afterward, when the elder Wheeler had settled down to the life of the fishing fleets, there came a Sunday afternoon of storm and wind—a gale that churned the seas to fury and drove in against the rocks a fine ship. John Wheeler and his son were the first to note the vessel's predicament, and they knew that she would pound to pieces rapidly the way she was lying on her beam ends. If they tried to reach their own boathouse for ropes and rescue tackle, it would be too late to do any good as the boathouse was some distance from the spot.

"Coastguards!" shouted the old salt, his hands on each side of his mouth to make himself heard above the roar of the storm.

The son nodded and they set out on a run for the nearby boathouse of the coastguard. Quite providentially they found it unlocked—a most unusual thing—and ran back with the tackle necessary to lower the old seaman down the face of the cliff, where he could throw a lifeline into the rigging of the stranded ship and help passengers and crew ashore with a breeches-buoy. When this was finally rigged, the first man to essay the perilous

passage along the swaying cable was—Lord Yarborough. Landing safely, he smiled and held out his hand as if he were greeting an old friend in the security of his London Club.

"Thanks, John—for the second time," said he.

"By the unfurled tops'l!" grinned the old sailor. "An' I 'opes your ludship 'as 'ad a pleasant v'yage!"

It was little wonder that the lads of Ventnor grew up a venturesome lot, reared as they were amid the hazards of their elders' calling. The boys followed the fishing smacks with longing eyes. They would have taken men's chances had they been allowed; as it was, they took risks enough in their swimming and boating feats about the coast.

The Chase on the Cliff-top

"Sig" Wheeler and his brother were in the thick of it, as is the habit of boys, who will be boys the world over. The day they went swimming at Steep Hill Cove and took to diving from certain boats against the wishes of the irate owner was an event to be remembered—a situation full of grave portent at the moment, but in time a recollection for open laughter. The aforementioned owner, having seized their clothes, came after them in a towering rage, so that there followed a wild chase along the cliffs. Like a pair of scared rabbits the boys fled among the rocks and scrambled madly up a path with which they were familiar, fortunately. Their pursuer, red-faced but determined, was hard upon their heels. Along the skyline of the cliff-top they streaked in desperation, their little legs flashing, their faces strained, clothed in bathing trunks and the short pants of breathlessness.

A couple of old women who sat on a bench looked up from their knitting and took in the situation at a glance. With great presence of mind one of them signalled the youngsters to hide behind the bench, and down they flopped out of sight just as the head of Old Vengeance rose above the edge of the cliff at the crest of the path. He came on, bewildered by the sudden disappearance of his quarry and with difficulty checking his oaths as he approached the old women. They continued to purl one and carry two (or whatever it is you do when you knit), and they chatted with him so agreeably that when he left them a few minutes later he was laughing and quite forgot to pick up the bundle of clothing which he had dropped when he sat down. Blessings on old grandmothers!

Wrecked!

Steep Hill Cove was also a fine place for boys to pretend they were pirates or smugglers or wrecked sailors on a coral islet. The Wheeler boys and some companions once came near being wrecked in very truth off Steep Hill Cove. A heavy sea was running and nobody at Ventnor would let them have a boat. So the young rascals went up the coast to another village and there purloined what they were after. Theirs was the only boat out that day and by the time they came opposite the Cove they were being tossed about pretty badly.

Now, the trick of beaching a boat on the crest of a big roller is no child's play; it requires considerable experience in timing the stroke of the oars and balancing the boat to ride the wave. Too far forward and the boat is swamped; too far back and the roller slips from beneath the keel and the succeeding roller swamps it. The first

thing the boys knew they were in the water and rolling up the shingle in a disagreeable confusion of boat, boys, oars and lunch-baskets. Fortunately none of the party was injured beyond a few bruises; they were more concerned over the fate of the biscuits and other things they had brought along to eat. Food and sea-water do not mix very palatably. Nevertheless, a fire was lit, the biscuits dried and the picnic enjoyed in spite of the accident.

The mackerel fishing was another delight of young Seager Wheeler. He saw as many as ten thousand mackerel in a single haul. When a school of these fish was located by the lookouts, posted on the cliffs with telescopes, the fishing boats put to sea. Directed by signals from the lookouts, they would surround with nets the big blue patch on the water which indicated the presence of the school. Gradually the boats would draw in towards shore until at last the whole catch would be hauled in on the clean shingle—thousands and thousands of fish flashing in the sun, silver, blue, purple, all the colors of the rainbow. It was a fine sight for anybody.

The Call of the Land

There were other fine sights in which young Wheeler took pleasure—sights not of the sea, but of the land. For the Isle of Wight was not all rock and water. Back inland to the famed Carrisbrooke Castle, where Charles I had been imprisoned, were quaint rural hamlets, nestling beside beautiful country roads. The fields were small, skirted by wonderful hedgerows, as was the Old Country way. Here the lark rose from the fragrant meadows to sing his matins.

Fig. 2.—Registration Certificate for Elite Stock Seed, issued by the Canadian Seed Growers' Association.

The boy who was destined to achieve fame as a farmer roved through the beech copses, along meadow paths that wound beneath stately elms or ash trees with their clusters of bitter red berries, or beneath chestnut canopies or sturdy oaks. And on these tramps young Wheeler acquired a love for the land as well as the sea. He knew where the birds nested, where the wild flowers grew most plentifully. He knew of wonderful glades of moss and fern and fresh water rills. He had the finest collection of birds' eggs in the Isle of Wight, the finest collection of postage stamps, the finest collection of coins. He liked to collect and sort things. And he liked to sit and watch the farm hands at work on the soil.

But even in these agricultural surroundings occasional sea-scapes of distant glinting water shone through the trees in unexpected places, as if to remind him that the ocean was at hand. As the boy grew, the romance of the sailor's life took hold of his imagination until his one ambition was to join the Navy. At the National School which he attended he was an eager scholar and he graduated at the early age of eleven years—a "smart" boy, they called him. Finally, he started to work for W. H. Smith & Sons, owners of a chain of news stands. He wore their gold-braided cap and, because of his constant chatter of the Navy, they called him "First Lord of the Admiralty."

The Loss of the Eurydice

Portsmouth, the great British naval centre, was not far away. Battleships, naval craft of all kinds, were a continual feature of the sea traffic and "Sig" never tired of watching the manœuvres. He will never forget the Sunday afternoon on which he stood watching the naval

training-ship, the *Eurydice,* as she passed Ventnor with all sails set. Her portholes were all open and from every one of them the sailor boys were straining their eyes towards home, Portsmouth Harbor, a few miles beyond. For there were five hundred young men aboard the vessel, returning now from a five-year training cruise in distant waters, and upon the harbor quay was waiting a gay crowd of mothers, sisters, sweethearts, brothers and fathers.

The day was beautiful, the sea comparatively calm and danger the last thing in the thought of a soul aboard or ashore. But although it was the month of May, sudden snow squalls occasionally swooped down about the Isle of Wight, coming up very suddenly. As Seager Wheeler watched and waved his hat, a black cloud which had attracted little if any attention all at once came down upon the sea and blotted out the picture completely for a moment. When it cleared, the sea was empty! The *Eurydice,* with all on board, had gone down before the eyes of the watchers and only the tops of the masts were left sticking up out of the water. The sudden squall had laid her over and the water had poured in through every open porthole and she had gone down like a stone.

Only three survivors were picked up! The sister boat to the *Eurydice,* the *Atlanta,* was another sea mystery. She sailed bravely away one fine day—and never came back. Not a soul on board was heard from again!

Such tragedies as these failed, however, to dampen "Sig's" ardor to become a middie. The glamor of the life remained with him to that final disappointing moment when his whole outlook was flattened by the knowledge that he was under size—that an inch "up and

down" and another "round about" decreed that it was not to be.

The sharp edge of his disappointment was to be dulled soon by a new development in the family affairs. About this time came a letter from far-away Canada, to which colony one of his uncles had emigrated not long before. Came also a pamphlet about a place called "Manitoba", illustrated by pictures of men plowing their first furrows on land which stretched as flat as the sea to its horizon. The prairies, with all their wonderful prospects, opened a new world of romance to the lad who had known only the sea and the tiny Island fields. He became eager to accept the opportunity extended by his uncle to join him in the great prairie country of Western Canada.

"There be wild savages and beasts in yon wilderness, boy," he was warned. "Indians what tears the hair from the head of ye and burns ye alive when they ketches ye lives over yender. An' there be bears in the back yard, an' wolves what gallops about seekin' the whom they may devour!"

This was even better than he expected, then! He would go by the first boat. Aye, that he would!

II

There was considerable excitement at Clark's Crossing, Northwest Territories, in the spring of 1885. Fish Creek, not far away, had been the scene of a fight between Canadian militia and the rebels, it being the time of the Northwest Rebellion. The sixteen-year-old boy who reached his uncle's shack at Clark's Crossing not long after the Fish Creek fight found himself on his toes with the excitement of his new surroundings.

The roads at the Crossing were choked with wagon-trains of army supplies going in. One of the newcomer's first shocks was the sight of a convoy of the 7th Battalion (London, Ontario) filing past with the dead. Government telegraph lines were strung all through the country and there was enough movement at Clark's Crossing just then to prevent lonesomeness, although it was over two hundred miles to the nearest railway. For a long time after that Fish Creek fight it was possible to dig bullets out of the trees.

Narrow Escapes

Seager Wheeler's uncle lived in a house made of logs. It had a sod roof. It stood on the bank of the Saskatchewan River and in the winter the ice jammed right opposite. Trying to cross this ice-jam, shortly after his arrival, young Wheeler had a narrow escape from drowning; as soon as his feet landed on an ice-cake it broke

into "candles", being porous from the action of the sun.

Several other narrow escapes occurred while he and his uncle were returning along the road which the settlers' sleighs had kept open all winter on the ice of the river. They were carrying fork-handles and a few groceries. Five times one or other of them broke through the ice, a dangerous situation because of the suction of the rapid current. Wheeler was carrying two small and very precious packages of sugar which had cost one dollar each. Now, a dollar was a big sum of money at that time and Seager Wheeler knew it. When he found himself in the icy water he still remembered it and hung on to the sugar at the risk of his life, much to the disgust of his uncle, who got him out with the greatest difficulty.

"We roughed it pretty bad in the early days," says Mr. Wheeler in recalling these incidents. "But I enjoyed those first three years in Saskatchewan. We were satisfied with things we would not be satisfied with today. We were hungry as hunters on the trail."

First Farming Experiences

The first harvest at which he helped was thirty acres of wheat. He and another man cut it with cradles and tied the sheaves by hand. The hay was cut with scythes and raked with hand rakes, farm implements being very scarce among the settlers. Grain was sown broadcast and often it was harrowed in with branches of trees; under such restrictions big fields were unheard of in the district. Wheat birds, blackbirds, and later on the gophers, went after the wheat; they raced wild geese and crows to see who could get most of it.

Fig. 3.—Visitors at Seager Wheeler's Farm Examining Improved Strains of Grain.

Following two years of farm labor, Seager Wheeler went to Moose Jaw to try construction work on the Canadian Pacific Railway; but finding this not to his liking he went back to Clark's Crossing and took up a homestead on the River Saskatchewan. His own first furrow he turned behind oxen with an out-of-date plow. He did not attempt farming on a large scale, for even at that time he adopted the principle of sowing the best possible seed on ground which had received the best possible cultivation. From the very first he picked over his seed grain by hand, eliminating weed seeds and foreign grain; this was a necessary part of the system by which he proceeded to test some theories of production which he had studied out for himself.

He nearly starved while this was going on. When at last he had wheat for sale he found that there was no place to sell it, except upon an exchange basis. This and certain soil restrictions on his homestead were sufficient to make him restless. He heard of a parcel of C. P. R. land five miles from Rosthern, Saskatchewan, went there and dickered with the company's agent for 190 acres at \$3.00 each.

They let him have it. He moved. He is there to-day. Wheeler planted Russian poplars (his favorite tree), maples and willows, and put in hedges of Caragana and Southernwood on that bald piece of prairie. "Maple Grove Farm," he named it, and here it is that he has achieved his great triumphs—has grown the world's championship wheat that made him famous.

Frozen Out!

But between that beginning and these later international successes stretch many years of patient struggle.

Great and lasting achievements are never the result of brief endeavors; they are built up by hard work unceasing, by faith unbroken no matter what the set-backs.

It has been that way with Seager Wheeler. Like other pioneer farmers of Western Canada he grew Red Fife wheat at first and was frozen out consistently—that is, two years out of three. The need for an earlier ripening wheat, yet one with equally high milling qualities, obsessed him. It became his ambition to discover methods of cultivation and seed improvement which would overcome the adverse conditions. "The best possible wheat in quality and yield" may be said to have been his objective throughout and it was an ideal which could be attained only by close study through hand-selection from seed plots; in these plots he would require to isolate not only different varieties of grain, but different strains of the same variety. In fact, as he went through his crops each year he selected a head here, another there, carefully segregating them according to their characteristics in order that he might plant them the year following in rows which would be the product of the individual head.

Work? He worked like the proverbial nigger! He was at it all day and when it got too dark to see he went into his little bachelor shack, lighted the tin lamp, got out his wheat selections and kept right on working half the night till forced to quit by utter fatigue. Minutely examining and sorting wheat kernels and tying wheat heads in tiny bundles and writing down comparisons and endless data—doing all this by the light of an oil lamp after a heavy day in the fields and keeping it up day after day, week in and week out—this is an effort behind which must burn the fires of a great enthusiasm,

the sort of enthusiasm which inspires the man of scientific bent.

"Wheeler is Crazy!"

Other farmers who observed how he put in his time, who saw the restricted areas which resulted from his laborious investigations, turned back to their own broad fields of grain and smiled as they thought of harvest-time and wheat at So-Much per bushel. That fellow Wheeler was crazy! When he told a few of them about his hopes and his theories for crop improvement they laughed at him. So he stopped talking, but kept on working towards his ideals as best he might, a man of natural scientific tendencies without scientific education.

Occasionally the commercial side of farming obtruded itself disagreeably upon his researches—as when the bottom of the grub-box stared up at him or another payment was due on his place. Then would follow a time of worry and arithmetic and a couple of head of cattle would be led bawling down the Wheeler driveway, never to return. He owned some live stock, luckily. Once the farm was all but sold over his head and but for another raid on the herd and a timely loan from McEwen, the friendly agent of the C. P. R. at Rosthern, Wheeler would have been dispossessed. As soon as the danger was past and palpitation gave place to accustomed heart-beats, Wheeler lit his pipe and went back to his beloved plots, his lunacy still uncured.

He had stopped growing Red Fife by this time and had turned attention to Preston wheat, obtaining ten pounds of pure seed from Dr. William Saunders, of the Central Experimental Farm at Ottawa. It ripened much

earlier than Red Fife and went sixty bushels to the acre. Wheeler worked out the purest strain of it in the country; but still he was not satisfied. Preston shattered too easily and did not grade high enough.

A Portentous Visit

About 1907 came an important turning-point for Seager Wheeler. It took the form of a visit from L. H. Newman, Secretary of the Canadian Seed Growers' Association. Up until now the little man from the Isle of Wight had been following a system of his own which was not quite according to the best methods of to-day. The Secretary of the Canadian Seed Growers' Association proceeded to give him a demonstration in selecting wheat and other grain right there on his own farm and the hours never passed more swiftly for the enthusiastic expert and his enthusiastic and intelligent pupil. It was a great day for Seager Wheeler, who gathered new inspiration from the commendation and advice of his visitor. Forthwith he joined the Canadian Seed Growers' Association and began to follow more direct methods in his seed plots with excellent results.

The ordinary Preston wheat which Wheeler was growing at the time was not fixed to a distinct type, but showed a mixture of reddish and white chaff, while the grain was both straw-colored and red. The first task he set himself was to select the white chaff variety; after that was fixed he had to separate the red grain from the yellow. In short, after three years' work he had to pick over his entire stock of hand-selected heads—thirty pounds of grain—every kernel, until there wasn't a yellow one left; to do this he had to rub out each head separately by hand. The beginner to-day can buy pure

seed to start with; but Wheeler was pioneering. The first year he set up a type standard, but couldn't find enough heads for a quarter-acre seed plot. The season following he found enough of the type needed, so raised the standard. In this manner he proved that by careful selection it is possible to increase the size and improve the shape of head and grains.

Lean Years—A Humble Dwelling

The years were still very lean for Seager Wheeler. His farm was not producing roast turkey, stuffed with oysters, nor did plum puddings grow on the bushes outside his humble dwelling. The humbleness of that dwelling began to bother him quite a little. There was a young lady over at Maymont—no, the dwelling was too altogether completely and entirely humble for anything like that! He asked Osmond Partridge what he thought about it.

"Henry," as he was called by those close to him, was Seager Wheeler's only help on the farm—a loyal worker and good friend who stuck with him through many years of patient effort, years with the ribs showing as well as later and more successful years. Henry agreed with him that the dwelling was very humble indeed, come to take a good look at it.

"What am I going to do? I can't afford to hire carpenters and that's the truth, Henry."

"Then we'll build her ourselves—nights," quoth Henry confidently.

They did that—built the new house themselves after the day's work in the fields. The farm went down, but the house went up. Seager Wheeler skipped over to Maymont and told Miss Agnes Lillian Martin—youngest

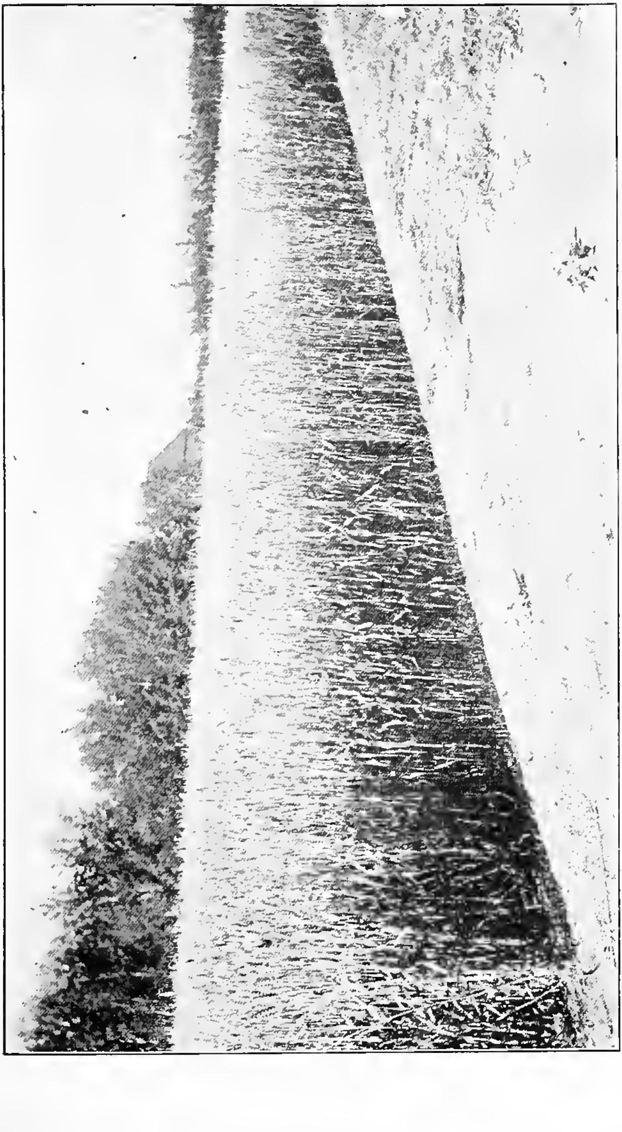


Fig. 4.—The Hand-selected Marquis Seed Plot which Produced the Wheat that won the $1,000 Prize at the New York Land Show, 1911.

daughter of Benjamin Martin, of Maymont—that his house was ready and it seemed propitious that they should be the first couple to celebrate their wedding in the new Anglican church that had just been built in Maymont. She was from Leicester, England, and she believed in Seager Wheeler and all his works. So Rev. Donald Schoffield, in the vestry of the new church opened a new page of the Marriage Record with their names and the date—December 17th, 1908.

Back to work went Wheeler with everlasting persistence. He was beginning to see some results; but only his intimate friends and relatives knew of his successes. They urged him to make exhibits at the winter and summer fairs, but to this advice he paid no attention—until 1910. That year, when he attended the Seed Fair at Regina and had gone over the exhibits, he got out his pipe and smoked over the realization that not one of them could stand up and keep its feet alongside some grain that he had at home. Hitherto his natural modesty had been holding him back; but now he saw that in the interests of better crop production generally throughout the country he had no right to withhold his improvements any longer.

His First Exhibits

The following year, therefore, he exhibited some wheat and oats at Regina and won several prizes. The experience taught him new methods of preparing exhibits. In this new direction he applied his customary thoroughness.

It was in 1911 that Dr. Charles Saunders sent Seager Wheeler a five-pound sample of pedigreed Marquis wheat. From this Wheeler produced four bushels and

thirty-five pounds. Another five-pound sample of Marquis he obtained from the Experimental Farm at Rosthern and one bushel from a seed firm at a cost of five dollars per bushel. Having threshed this wheat, he mixed it all, then selected the best two bushels that he could produce to become an entry at the New York Land Show in 1911.

He had decided to exhibit at this international event the best prepared exhibits he could provide. Wheeler was more curious than sanguine in this connection—more curious to find out how far down the scale he would stand in competition with the world's expert growers than sanguine that he had a chance against the wonderful products which the great show was bound to call forth. He hoped to profit by the experience, but not in any financial way.

As it happened, there were big prizes on the list. The late James J. Hill, President of the Great Northern Railway, was offering a thousand-dollar gold cup for the best hard red spring wheat grown in the United States.

"I dare you to throw this prize open to Canada," challenged Sir Thomas Shaughnessy (Now Lord Shaughnessy), late President of the Canadian Pacific Railway. Sir Thomas had a wonderful belief in Canadian hard wheat and the Canadian Pacific Railway for many years had spent vast sums in the encouragement of agriculture. It looked like a good chance for a try-out.

"Grown in the United States," repeated "Jim" Hill in refusal.

"All right. The Canadian Pacific Railway will offer $1,000 in gold for the best hard red spring wheat grown *on the continent,*" declared its President, and immedi-

ately the competition became the focus of keen interest everywhere.

His First World's Championship

When the news that he had won the world's championship came over the wires and finally reached this unassuming little farmer, away up at Rosthern, Saskatchewan, Seager Wheeler fumbled for his pipe. He could not realize that he had won actually. The wheat had been grown in an unfavorable year without any special attention.

However, he was soon to know that he *had* won. Telegrams and letters of congratulation came in an avalanche from every direction—seventy-five a day. Newspapers and magazines wired for the story of his success. Reporters and special writers came in clusters and singly and walked all over the place. Photographers came and took his picture when he wasn't looking; they caught him in dusty overalls and his oldest and most weather-beaten broad-brimmed straw hat—at work in his fields; they made him dress in his Sunday-go-to-meetings and sit at tables, toying carelessly as it were with empty ink-bottles out of which stuck sprigs of the championship wheat. Civic and other official bodies lured him to banquet-places and dined him and wined him and were kind to him. Everybody lined him up with the benefactors of his district, his province, his country. It was all true, too—the biggest advertisement Canada had had. Seager Wheeler would have died if it hadn't been for his pipe! But he survived it all, though greatly bewildered by the harrassing attacks of sudden fame. So many demands were made upon him that there was no time to

attend to the cattle or the farm work, he objected plaintively.

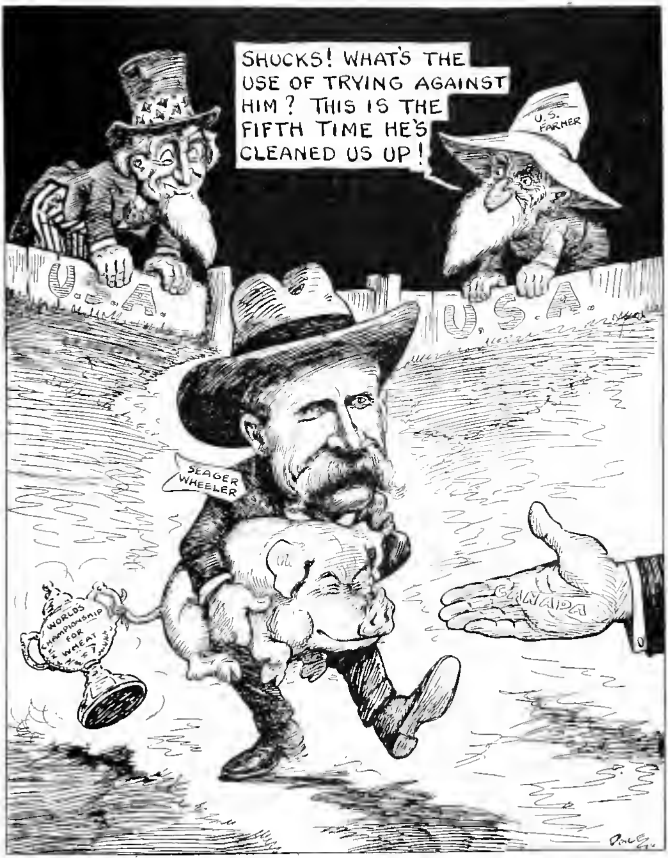
Nevertheless, he was glad that Canada had won, that Saskatchewan had won, that Rosthern had won, for he was quick to realize the publicity value. Also when the big C. P. R. prize of gold coins, in a fine morocco leather case, silk-lined, was presented to him at a big banquet in Calgary, where Government officials, agricultural experts and prominent citizens gathered to do him honor, there was satisfaction in knowing that with two bushels of wheat he was more than able to pay with C. P. R. money for his C. P. R. farm—a debt which had caused him many heartburnings.

III

The year following his championship win at New York the weather in Northern Saskatchewan defeated Seager Wheeler. In 1913 he suffered the bitter experience of being completely hailed out. In 1914 Wheeler managed to get another exhibit together for the International Dry Farming Congress at Wichita, Kansas, again winning the sweepstakes prize with Marquis wheat. He repeated this championship victory with Marquis the following year (1915) when the big show was held at Denver, Colorado; not only that, but he won first prize for sheaf Marquis, first prize for sheaf Kitchener wheat, sheaf Victory oats, sheaf Canadian Thorpe barley, sheaf of winter wheat and sheaf of soft spring wheat. In 1916 he went to the International Show once more, this time at El Paso, Texas, winning sweepstakes with his Kitchener wheat, as well as first prize and sweepstakes on Canadian Thorpe barley, first prize on Arthur field peas and a number of other prizes.

Hailed Out Twice!

His 1916 exhibits, however, were not grown in 1916; they were from his 1915 crop. The reason was that in 1916 Seager Wheeler was again entirely hailed out. It was the most destructive hailstorm Northern Saskatchewan had known for many years. Both the Rosthern Experimental Farm and the Wheeler farm were in the path



BRINGING HOME THE BACON.

Fig. 5.—Cartoon published in *The Grain Growers' Guide,* October 30, 1918, after Seager Wheeler had won the World's championship for wheat for the fifth time.

of it and the crops on both farms were a total loss. In the town of Rosthern all windows facing the drive of the hail were smashed like eggshells; the chimney of the church was blown down; a couple of barns were flattened and stores and cellars flooded. An Experimental Farm teamster was badly hurt when his maddened horses ran away. At the Wheeler place the finest fields of grain the world's champion had ever grown—fields which promised a yield of sixty and seventy bushels per acre; grain which promised to ripen earlier than his earliest Marquis—all these were destroyed utterly.

It was a heart-breaking experience for Seager Wheeler. For three years he had slaved unceasingly to recover from the former hailstorm disaster and to find all his best experimental plots, his most promising selections, again gone completely was enough to discourage any human being. It was like the artist discovering his great masterpiece destroyed over night by vandals. It meant the loss of years of work, a set-back in his evolution of better crops for the whole country; it meant more—a return to the days of impoverishment for himself and his family; for he had not one cent of insurance to blunt the blow.

His life-work was not blocked altogether, fortunately. There was a little seed saved and some small plots of several varieties and strains with which he could begin all over again. Bravely the little farmer from the Isle of Wight went at it once more. In 1917 he exhibited potatoes and won the sweepstakes; also on his wheat sheaf. Seager Wheeler was coming back.

But what a pity that a man who had proved himself a national asset should be forced to perform his services under handicaps—that his researches should be retarded

by every cross-current that swung the vane of his actual living needs this way and that! One is inclined to join the journalistic chorus for Government action in this connection—for endowments or scholarships or other assistance which would enable Seager Wheeler to travel and study that he might bring to bear on his great work the full measure of intelligent direction.

Seager Wheeler's Winnings

That it is a great work which he is performing will be recognized upon a glance at a few of his winnings. In the case of Seager Wheeler the mere winning of prizes has never been his object—prizes for their own sake, that is. The honor attached to the winnings is gratifying, of course; but the real satisfaction to Seager Wheeler lies in the knowledge that his years of patient effort are producing successful results which are acknowledged by those competent to judge—that his products have qualified as seed for general improvement of crops. It is doubtful if a complete list of all his winnings ever will be recorded, but here are some of them:

World's Championships and Other International Prizes.

Wheat.

1911—Marquis Wheat—New York Land Show—Won first and sweepstakes, capturing $1,000 in gold offered by the C. P. R. for the best hard red spring wheat grown on the continent.

1914—Marquis Wheat—International Farm Congress, Wichita, Kansas—Won sweepstakes.

1915—Marquis Wheat—International Farm Congress, Denver, Colorado—Again won sweepstakes; also

first at International Irrigation Congress, Bassano, Alberta.
Sheaf Kitchener Wheat—Seager Wheeler also entered an exhibit of sheaf wheat at Denver and captured highest honors.

1916—Kitchener Wheat—International Farm Congress, El Paso, Texas—Sweepstakes won for the fourth time. Although hailed out in 1916, Seager Wheeler exhibited 1915 threshed Kitchener wheat. This new wheat selection beat everything in sight.

1917—Red Bobs Wheat (sheaf)—International Farm Congress, Peoria, Ill. — Another new Wheeler selection, which carried off the sweepstakes.

1918—Red Bobs Wheat—International Soil Products Exposition, Kansas City—Won sweepstakes for the fifth time. Also first for sheaf hard red wheat.

Oats.

1915—Victory Oats—International Farm Congress, Denver, Colorado—Won sweepstakes with a sheaf exhibit; also first, group exhibit, Canadian Seed Growers' Association.

1917—Victory Oats—International Farm Congress, Peoria, Ill.—Won second prize, sheaf exhibit.

1918—Victory Oats—International Soil Products Exposition, Kansas City, Kansas—Won first prize, sheaf exhibit.
Mr. Wheeler has not exhibited oats as frequently as his other grains.

Barley.

1914—Canadian Thorpe Barley—International Irrigation Congress, Calgary, Alberta—Won third prize.

1915—Canadian Thorpe Barley—International Farm Congress, Denver, Colorado—Won first prize for sheaf exhibit.
O. A. C. 21 Barley—At the same international show won first prize also for sheaf exhibit of this barley.

1916—Canadian Thorpe Barley—International Farm Congress, El Paso, Texas—Won first and sweepstakes.
O. A. C. 21 Barley—At the same international show won first prize.

1917—Canadian Thorpe Barley—International Farm Congress, Peoria, Ill.—Won first prize, sheaf exhibit.

1918—Canadian Thorpe Barley—International Soil Products Exposition—Won first prize, sheaf exhibit.
O. A. C. 21 Barley—Same show—Won second prize.

Saskatchewan Provincial Seed Fair and Other Exhibition Wins

Wheat.

1914—Marquis Wheat—Provincial Seed Fair—Took second prize, and first prize in Canadian Seed Growers' group exhibit.

1915—Marquis Wheat—Provincial Seed Fair—Won first and sweepstakes; championship cup trophy (to be won three times); Canadian Seed Growers' group exhibit, first prize; Regina Provincial Exhibition, first prize; Saskatoon Industrial Exhibition, first prize.

Oats.

1916—Victory Oats—Provincial Seed Fair—Won second prize, and first in group exhibit, Canadian Seed Growers.

Barley.

1911—Canadian Thorpe Barley—Provincial Seed Fair—Took first prize.
O. A. C. 21 Barley—At the same Fair captured first prize.

1912—Canadian Thorpe Barley—Provincial Seed Fair—Won third prize, and in Canadian Seed Growers' group took first prize.
O. A. C. 21 Barley—For this barley Wheeler won first prize at the same Fair, and first in Canadian Seed Growers' group exhibit.

1914—Canadian Thorpe Barley—Provincial Seed Fair—Took first prize.
O. A. C. 21 Barley—Provincial Seed Fair—Took first prize, and also first in group exhibit of Canadian Seed Growers; at the Saskatoon Industrial Exhibition this barley won first prize, a special prize and C. P. R. first prize.

1915—Canadian Thorpe Barley—Provincial Seed Fair—Won first prize and Canadian Seed Growers' group exhibit first prize; at Regina Provincial Exhibition, first prize.
O. A. C. 21 Barley—Provincial Seed Fair—Won fourth prize, and first in Canadian Seed Growers' group exhibit; Saskatoon Industrial Exhibition, first prize.

1916—Canadian Thorpe Barley—Regina Provincial Exhibition, first prize; Saskatoon Industrial Exhibition, first prize; Provincial Seed Fair, first prize, and Canadian Seed Growers' group exhibit, first prize.

Summary of Grain Prizes.

Wheat.

Marquis—4 world's championships and 1 international first, 5 Saskatchewan firsts, 1 second—Cash value nearly $3,000.

Kitchener—1 world's championship and 1 international sweepstakes for sheaf exhibit. (Exhibited only twice).

Red Bobs—The first time Red Bobs was exhibited it took the sweepstakes. The exhibit was sheaf wheat.

Oats.

Victory—1 international sweepstakes, 1 international second prize, 2 firsts and 1 second.

Barley.

Canadian Thorpe—1 international sweepstakes, 4 international firsts, 1 international second, 1 international third, 10 Canadian firsts, and 1 third.
O. A. C. 21—3 international firsts, and 1 international second, 9 Canadian firsts, and 1 fourth.

Other Exhibits.

Besides his grain exhibits, Seager Wheeler has done a lot with various grasses, fodder crops, potatoes, etc., and has taken many awards for his exhibits in this direction. He won the international sweepstakes at Peoria, Illinois, in 1917, with Early Ohio potatoes, and first prize with Gold Nugget, selected from the well-known Irish Cobbler.

At the International Soil Products Exposition at Kansas City, 1918, Mr. Wheeler won the world's championship for wheat for the fifth time with an exhibit of Red Bobs wheat. He also captured the C. P. R. special for hard red spring wheat, first for sheaf barley, second for sheaf peas, second for brome grass seed, third for sheaf hard red winter wheat, first for sheaf hard red spring wheat, second for barley, first for sheaf oats, third for peas.

Twenty Years Without Crop Failure.

In the twenty-odd years that he has been farming at Rosthern, Seager Wheeler has never had a crop failure, dry years or wet years. He grew his championship wheat

To Seager Wheeler

OF ROSTHERN SASKATCHEWAN

Winner of the Thousand Dollar prize donated by Sir Thomas G. Shaughnessy president of the Canadian Pacific Railway Company for one hundred pounds of BEST HARD RED SPRING OR WINTER WHEAT grown in the two Americas, exhibited in the world contest held at Madison Square, New York, November 3rd to 12th 1911.

Sir:-

Fig. 6.—Facsimile of the Illuminated Address presented to Seager Wheeler by the Calgary Canadian Club in honor of his first world triumph as a prize grain grower.

in years when the rainfall was only half the normal precipitation. The secret of his success lies in good seed and proper tillage. Here is a man who grows wheat 63 bushels to the acre, chin high, so thick you can't draw a leg through it; who knows his soil so well that he can tell just about what his yield will be (barring accidents) as soon as the crop is above ground; who grows potatoes six hills to the bushel, with single tubers weighing almost four pounds, in a year when many had no crop at all; who has not only won the world's championship for wheat five times, but has so developed and improved Canadian Thorpe barley that this two-rowed variety is producing more heavily on his own farm than any six-rowed variety now in use; who makes Victory oats produce a much larger crop than Banner oats; whose work with various kinds of clover, peas, beans, corn and grasses already has been remarkable, and who has developed two wheats (Kitchener and Red Bobs) which have achieved a yield of 80 bushels to the acre.

No farm on the continent has extended more far-reaching circles of influence than this little quarter-section farm in Saskatchewan because the man who runs it has made it his very soul's concern. Money-making has been farthest from his thoughts; yet Seager Wheeler, capitalized, would net astounding dividends. Reaching out for Fame that his vanity might be gratified never could be an element of success to this plain farmer, encased in hard-shell modesty; yet Fame has worn a path to his unpretentious door and along it have come agricultural experts—themselves internationally famous—to do him honor. No, Seager Wheeler's success has been achieved because it has arisen from the well-spring of *service*—an earnest desire to use the gifts of applica-

tion and scientific understanding and research for the welfare of his fellow farmers, to accomplish something which would be good. To this task he has dedicated his life and applied himself with all his energies through many years of hard work in the face of every discouragement.

A Plain Farmer.

It is hard to grasp the full significance of his work while chatting with him at close range. Seager Wheeler looks like an ordinary, plain, Western Canadian farmer, and that is what he believes himself to be. The bald part of his head is no different from the bald parts of other heads; he is below the average in height; at the top of his success he still lacks the "inch up and down" and "another round about"; his clothes are not pressed every other day at the tailor's, and at times his tie quarrels with his collar. But these poor details are submerged in the gentle human qualities of the man and one visualizes him at home, immersed in his work, his three girls busy picking up discarded wheat stalks and tying them in bundles in imitation of their daddy.

And back there on the little farm, while he gazes across the sea of waving grain and listens to the whisper of the wheat, there are times when Seager Wheeler longs to make one trip back to the places he knew as a boy—for he has never gone back—to the Isle of Wight where the roaring seas dash high against the cliffs he knew so well. They tell him that the site of the old home is a couple of miles out at sea now, through the action of the restless waters, and he wants to go back "just for a look around." It is a very natural desire, the gratification of which none will deny him.

But Seager Wheeler has become as much a part of Western Canada as the championship wheat which he grows. He is not looking for any better place. He has added a quarter-section to the farm lately and plans certain improvements which will make it a topic of conversation for everyone who sees it.

His blue eyes twinkle and brighten as he talks of his future plans and the minute he begins to talk grain, soil cultivation or some of the many problems with which our farmers are wrestling—then, and not till then, does one get a glimpse of Seager Wheeler, the world's champion grower of grain.

To him a buckskinned gauntlet raised in salute.

—*Hopkins Moorhouse.*

Fig. 7.—$1,000 in gold won at the New York Land Show, 1911, the scene of Mr. Wheeler's first world triumph.

PROFITABLE GRAIN GROWING

SEAGER WHEELER

Profitable Grain Growing

CHAPTER I

The Soil and the Seed

There is no more worthy occupation under the sun than Agriculture. It can be made interesting, fascinating and pleasure-giving; it can be made profitable. Nature provides that where the soil is put in condition and the seed is sound there will be a seedtime and harvest for all without fail; each plays an equal part in this result—first, the soil, then the seed, planted at the right depth and surrounded by the necessary moisture, heat, and air whereby the seed shall die so that a new life may spring forth. Whether that seed be the small grains of wheat, oats, barley, etc.—whether it be flower, fruit, or lordly tree, there is untold pleasure to be had in caring for the growth of that small, insignificant seed through all its stages until it comes to fruition. But it is a delight which can come only to those who are willing to follow up in detail the necessary steps of crop production to fit the soil for the seed.

The first consideration of the man who goes on the land is financial inducement. Very few give much thought to the pleasure that may be had in producing a perfect plant and crop, aside from its value in dollars and cents;

but to achieve success one must take a keen interest in his work. The same law of success holds good in every occupation. Agriculture is a life work, and while in some other profession or business the work may be taken up and dropped at intervals, this cannot be done in agriculture. Considerable study of many problems are called for in agriculture; but he who will but take a deep interest in his work and make application of the lessons learned can expect confidently to be successful as an agriculturist.

No hit and miss method will do. Simply to make the land black and put the seed into the soil indiscriminately without any well-defined method and purpose will not do; such carelessness is the real cause of many crop failures. To be most successful one must know his soil, its character and requirements, and the best methods of handling and cultivation. One must be observant, ready at all times to learn; for agriculture is the greatest of all schools. New problems are arising constantly; so that no matter how much a man knows he can learn still. There is much theory in agriculture, some of it good and some bad. Sound theory applied in practice is the best course to follow and, if we are willing to learn, we can profit by the experiences of others.

In agriculture we pay dearly for our experience. It may well be that another man's experience under similar conditions with which we ourselves may be faced will be worth many dollars to us and prevent much loss of time and effort if we but heed the lesson. If the seed fails to come up early and the crop is not up to expectation, dig down and find the cause. Should the crop be patchy, then discover the reason; it may be traced to weeds in the crop or the seed may be at fault, or some of the seed

may be lying in the ground out of reach of the moisture, or, again, the seeder may be at fault. An opportunity once lost may not return again in a season. For good or bad the crop is in the ground and past remedying for that season, and so shall the harvest be according to our preparations.

It will be apparent that the seed is of vital importance. Not only should it be sound, but of the highest breeding possible. Should there be the slightset doubt about the vitality of the seed make a germination test. This is an important matter. One may be deceived by the appearance of the seed, which may be of good size and still show poor germination.

Factors Controlling Crop Yield

Among the factors controlling crop yield, and which in turn may be, to a greater or less extent, controlled by the farmer, are: drought, weeds, rust, frost and smut. While man cannot make the weather, he can combat its effects on the crop by proper preparation. Some of these enemies of crop yield will be met in certain districts more than others.

Drought, for instance, is a danger to which some districts are subject more or less every year. The methods outlined in the chapters on tillage operations—Summer Fallow, Fall Plowing, Spring Plowing, etc.—will reduce the loss from drought materially if applied intelligently. As a matter of fact, the most satisfactory crops are often grown in seasons of light rainfall, providing there is sufficient moisture to germinate the seed. There will be little evaporation until after the crop is well established, evaporation taking place more rapidly when the crop begins to cover the ground at the stooling stage, and later

at the shot blade stage. This is the critical period of the plant's growth. We look for rains to fall in June, when most needed, this being the rainy period; but very often the rains fail to come until July. Hence the more moisture we can store up previously the longer the crop can carry on until the rain comes to relieve the situation.

Fig. 8.—An 80-bushel Oat Crop grown in a dry year.

Many a fine promising crop goes to pieces towards the end of June for want of sufficient moisture in the soil. The effect on the crop is to reduce the outside stools or stems, these turning yellow and dying and thereby lessening the number of stems per plant. When this happens, and the season is advanced and rains come, a fresh set of stools may appear, but often result in what is known as a "second crop"; at harvest-time this second crop is not matured fully, with the result that an uneven sample of grain is produced.

Droughty conditions coming at the same time the crop is headed out sometimes has the advantage of hastening the crop to maturity, and so lessening the danger from early fall frosts. But the critical time is when the plant is shooting up in the stem stage, and if we provide a condition to carry it past that danger point there is every chance of the crop coming to full maturity.

Weeds, Frost, Rust and Smut

Weeds are responsible for many light and unsatisfactory crops. Weeds and grain cannot occupy the same space. One or other must give way, and invariably it is the grain crop that does so, as weeds are more persistent and better able to hold their own. They use up the available moisture which is so necessary to the crop. (See Chapter on Weeds and Their Control.—Page 66).

Frost, especially in the early fall, has been the cause of considerable losses by reducing the yield and weight of the grain per bushel and lowering the grade and price. These losses may be reduced to the minimum by seeding in proper season, by fitting the soil, by the use of sound, plump seed, by encouraging rapid growth, and by sowing early varieties.

That we will be able to avoid damage from fall frosts may be a broad statement to make, and I want this point clearly understood. A variety of wheat that will mature two weeks earlier than Red Fife or a week earlier than Marquis will meet the situation. We can do even more by helping the crop along in its early stages to induce strong, rapid growth, instead of putting the seed into the soil indiscriminately before the soil is properly fitted to receive it so that germination is uneven or does not take place until rain comes. Ofter that is too late. Many a

crop of grain is seeded on plowing that is not prepared—often directly after the plow—in the haste to get the crop in the ground. "Make haste slowly" is good advice.

Rust is another factor which is responsible in some seasons for large losses. To overcome it the advice given for frost conditions should be followed out, particularly the seeding of early maturing varieties.

Smut in the past has resulted in much loss to farmers; but happily this is overcome by proper treatment of the seed.

The Secret of Successful Agriculture

In the following pages I hope to point out the profitable methods of soil tillage and the production of high-class seed that have proved successful in my own case after some thirty years of grain growing. I want to encourage every reader to better efforts, to a higher interest in agriculture, to look upon the work of grain growing or crop production as something worthy of the best that is in us. It is not sufficient to plan how many bushels of grain can be taken off in a single season with no forethought of the future. The soil is ours to make or mar, and we should aim to leave it, when the time comes for us to pass it on to a future generation, practically in as good or better condition than when it first came under our hand. Not in all cases, perhaps, will this be possible; but at least we may leave it as nearly right as lies within our power.

Early settlers in a new country, unacquainted with problems of soil and climate, were bound to make many mistakes which may now be avoided. As already pointed out, mistakes leading to disastrous results may be rectified in a short period in many other lines of endeavor;

but in agriculture the effect of a single mistake or a misapplied effort may be in evidence for several seasons. Once the crop is planted, it is planted, and, good or bad, there is no remedy for that season from any mistake of preparation that may have been committed. If in writing this book I can induce the careless and indifferent to follow a more definite system that will make crop production both a pleasure and a profit; if those who

Fig. 9.—"As ye sow so shall the harvest be."

have met disheartening results in the past through a lack of understanding of the requirements of soil and seed find encouragement in my experience; if the novice is initiated into sound and safe paths—then will the labor involved be not in vain.

Average Yields are too Low

For while our average yields cannot be considered as low, the fact remains that we are not producing as freely as is possible in this country. One may be cropping more acres than can be cropped profitably. What is wanted, in such cases, is not more acres in crop, but better pro-

ducing acres. By careful and intelligent use of better seed and better tillage it is possible to increase the average yields of the present time. Beyond question is this so. Omission, oversight, carelessness in the work done in the field mean disappointing results, and often it is possible to put the finger on the exact spot where the fault lies.

When we develop a higher interest in our work and create an intense love for all growing plants—grain, fruit, flowers and trees—we surely shall make fewer mistakes. Every plant of grain we grow is our own creation to a great extent, a form which we produce that will be pleasing or otherwise, and yield according to the effort that we have made. "As ye sow so shall ye reap" is literal in the case of agriculture.

So let us put a little more enthusiasm into our work and, according to our ability, specialize to some extent. When we meet a problem let us tackle it and find a way to meet it. Let us make the most of our opportunities and do the right thing in the right place at the right time. For this is the secret of successful agriculture.

CHAPTER II

Seeding Operations

The principles of agriculture remain true and unalterable, although the method of applying them may be varied to suit each district. It is rather a difficult matter to lay down any hard and fast rule as to the exact method to be adopted for a given result, and all I can do, therefore, is to adhere to those methods which have proven successful in my own case. The reader who keeps as close as may be to the methods described cannot go far wrong. In the chapters of this book there will necessarily be some repetition, inasmuch as various farming operations are closely related to each other. I have endeavored to lay out the chapters in as logical a way as possible and to devote full chapters to such operations and phases as seem to merit more than a passing mention.

In taking up the matter of seeding operations I shall assume that the seed bed has been properly prepared. Many farmers follow the common practice of rushing the seeder upon the land in the spring; but nothing is to be gained by seeding too soon, since wheat will not germinate at a temperature lower than 40 degrees Fahrenheit, and the soil is often at a lower temperature than this early in the spring. If the spring is wet and cold there is the danger that the seed, especially if not of strong vitality, will rot and die. At the same time, the seed

should go into the soil as soon as the temperature of the soil is right, as it is important that the plant develop a good root system, and if the seed is not sown until quite late it will come up in a few days, running to top growth at the expense of the root system, and it will not stool as freely.

Depth of Seeding

Not many farmers get down on their knees and find out how deep the seed is going into the soil; yet the de-

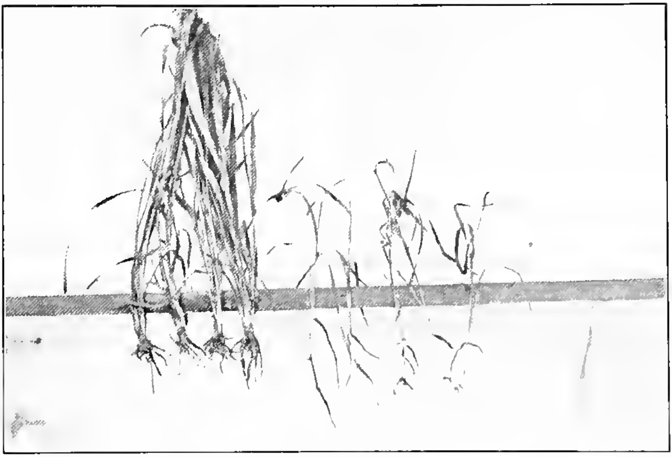


Fig. 10.—Showing the desirability of Seeding at the proper depth. The plants at the left were sown one inch deep and have no double rooting system. Those at the right were sown deeply and show only one or two roots and a single stem each. These plants were seeded the same day and taken up on the same date.

positing of the seed at a uniform depth, and the right depth, is very important. Many seed deeply to offset a possible drought, their idea being that if sown deep the

wheat will withstand a drought. As a matter of fact, this will have just the opposite effect. In most cases nothing is gained and much may be lost by deep seeding. Bear in mind, I am referring just now to prepared summer fallow, with the moisture at or near the surface.

If we seed deeply—say three inches or more—the seed is down in the cold soil away from heat, light and air. It takes a long time to come above ground, and if the seed is of weak vitality a weak plant is the result. When the plant gets above ground it begins to strike out a fresh root system near the surface, and will not be as strong and healthy a plant as it would if sown at the right depth—one and a half to two inches. If the moisture is there I make it a rule to seed not more than one and a half inches deep ou well prepared fallow. In the more arid districts it may sometimes be necessary, of course, to sow the seed at a greater depth. In any case the seed should be put down to the moisture. This may be two or three inches below the surface. In such districts the upper portion of the soil is capable of carrying the air and heat down to the moisture liue. Where the moisture line is lower than three inches, one must make the best of the situation, but a second rooting system will be thrown out near the surface when the rain comes.

Vigorous Growth in the Early Stages

If we want to harvest a bumper crop we must do all in our power to bring about rapid, strong, vigorous growth without any check. Checked in its growth, the plant will suffer in most cases and will not be as strong as it should be.

When the grain is about 10 or 12 inches high, we may find the head already formed by carefully stripping the

stem. It is very small, yet discernible. When the heads are formed, so are the spikelets; no conditions of season, favorable or otherwise, nor any means that may be employed can increase the number of spikelets when the heads are thus formed. Small or large, four-rowed, eight-rowed or ten-rowed, there they are. But at the time of fertilization, later in the season, the number of grains in the spikelet may be increased or decreased according to climatic and soil conditions.

Having this in mind, it is necessary that we do all we can to bring about a rapid and vigorous growth in the early stages of the plant. This may be done by looking after the important details from the time we prepare the seed bed to the sowing of the seed, and again late in the season.

The seed should be sown, preferably, not more than two inches deep. Germination is strong at that depth, and the plant does not develop a second root system, as in deeper seeding. Instead, it strikes out a strong set of roots that reach on every side for the necessary plant food in the proper temperature. It comes above ground sooner, and after being in the soil for about three weeks it has developed a healthy root system. So later it will develop above ground strong and healthy, with larger heads, and if by chance unfavorable weather conditions prevail, it may be relied upon to hold its own better than the thin, weakling plant which results from deep seeding.

A Practical Illustration

I had no better illustration of this fact than in June, 1914, during the hot, dry spell which we experienced. I took occasion to go into three different fields on the farm—fields of two different varieties of wheat—and

found by investigation that the plants from the seed I knew had gone too deeply in a certain part of the field were showing the double rooting system. The roots which first struck out at germination were there, and a fresh set had just formed with about three small, short roots. The plants showed signs of suffering; they were weak and spindly, with but a single stool. Close by were plants sown at one and a half inches, and here I found a solid bunch of long, healthy roots, a single rooting system and a top growth of four to six healthy stools, large and strong. The difference in the height of the two plants was remarkable; the deeply-seeded plant was less than half as long as the other, and, as I said, showed signs of suffering. This was not confined to a single plant, but to a great number in different parts of three different fields. I am convinced that if all my field had been sown deeply my yield would have been light; fortunately I had learned already the lesson of seeding grain at the proper depth. I may add that these three fields were sown under different conditions—one on summer-fallow, one on spring plowing, and one on fall plowing; so that I am not referring to an isolated case.

The lesson to be applied is that the deeper seeded grain took a longer period to get above the ground. After finally getting above the surface the plants had to strike out a fresh root system when conditions were not as favorable for so doing as in the earlier stages of growth. The hot, dry weather interfered and the plant, as it were, was in the air with conditions getting worse. The other plant, seeded at the proper depth, quickly developed a good root system, and when it got above ground its top growth was rapid, and because of its deep roots the plant better withstood the hot, dry spell.

Seeds an Equal Distance Apart

The importance of planting seeds in the soil at an equal distance apart is not often thought of. In this respect seed drills used at the present time are far from perfect. Not only should the seed be planted in the soil at a uniform depth, but also at uniform distances apart

Fig. 11.—Showing Stages of Root Development.
The two plants at the left show the rooting that takes place before the plant shows above ground. The next four have reached the single leaf stage, and the last two plants are well established.

in order that each plant may have an equal chance for development.

No better proof of this fact is needed than will be furnished by the study of the single head or plant sown in a small seed plot. This seed, dropped by hand more uniformly than by the seed drill, will give the best re-

sults—more robust, healthy, strong, vigorous plants with larger heads, more heads and larger grains, giving increased yield and better quality. But as it is not possible to sow large fields by hand, let us see that the drill does not sow too thickly in the drill rows.

It is the general impression that seed sown thinly takes a longer period to mature than thickly seeded grain, and in many cases this is true. However, that does not prove that thinly sown grain will not mature before danger from frost in the fall. In considering the right amount to sow, we have to watch out for drought as well as frost—and during the past four or five seasons we have seen the effects of drought during June.

In the early days, July was the critical month for drought. A drought or hot spell during the month of June is serious, that being the time for the plant's most rapid growth. It is the usual rainy season, and if we do not have a fair amount of precipitation in June the crop will suffer and come into head before its natural time. Often if the rain comes early in July the plants take on a second growth.

If the seed is sown too thickly to overcome the danger from frost, and we should experience the hot, dry spell during June, the crop is going to suffer. A practice I have followed for a great many seasons is to seed 80 pounds of wheat per acre on summer-fallow, and slightly less on breaking and stubble plowed lands; but this 80 pounds of seed was all graded and practically every seed grew. I cannot advise every farmer to sow this amount; a great deal depends upon the district and the nature of the soil and seed bed. The amount stated carried the crops over the critical stage of drought during the month

of June when every ounce of moisture was needed to support the growing crop.

There is much more to be said about seed—its hand selection, head-row selection, mass selection, seed plots, cleaning the seed, keeping up its quality, etc. There is also much to be said about the preparation of the seed bed. These matters are so important that they are dealt with separately in subsequent chapters.

CHAPTER III

Breaking and Backsetting

The best method of putting new lands in shape for a crop is a matter of general interest in Western Canada, particularly a crop that will give maximum yield. It is quite possible to obtain high yields on new breaking or backsetting if the soil is prepared properly.

With such preparation in mind, it will be well to consider some factors that may control crop yields. It is very important that the sod should be well rotted as soon as possible after it has been turned by the plow; for then small grain—wheat, oats, barley, flax and other crops—can be made to produce abundantly.

There is, of course, a proper time to do this work. That time is limited to about six weeks—from about the middle or third week in May until the end of June. Many newcomers, and others not acquainted with conditions in Western Canada, are under the impression that almost any time will do to break up prairie lands; but this is not so. Often the breaking season is extended too late in the season, and the effect is seen in lighter and unsatisfactory yields, not only in the following season, but for several seasons in succession.

Why Seasonable Breaking Pays

The most satisfactory results are got when the work is done early in the season, not later than the first week in July. After that time conditions are not so favorable for the rotting of the sod. When broken up early, throughout the month of June, there is every possibility that the soil will rot quickly under the favorable conditions; but when not broken until late in July the sod dries out, and while on the surface there does not appear to the casual observer to be any great difference, there is such difference, and it shows up in the following season's yield. The effect will be revealed upon personal examination of the sod; the under portion of the furrow slice, broken at the proper time, will be found, when lifted, to pulverize easily, with the grass and fibre decomposed, while the later broken furrow slice will be dry as when plowed. To the inexperienced this will not mean much at the time, but will be obvious the following season in the difference in crop growth and yield. The effect of late plowing and drying out will be very noticeable for some seasons after, and no matter how much work is put on the land it will not yield as freely as when the breaking is done in season.

Yes, in the early days we used to break prairie in the spring and sow to wheat or oats. But the crop returns were light, and the bad effect was to be noted in after crops. The growing crop used up the moisture needed to rot the sod, which simply dried out. It had the same effect which is noted when breaking is done too late in the season.

It will not be long after the sod is broken up, if in the proper season, before it will be found that the under

portion is in a condition similar to a rotting manure pile; that is, the grass is wet, steamy, decomposed, and in time the root fibre also decays.

How Deep and How Often

Now, what is the best depth to plow? Should it be plowed once only, or backset? In some districts where the native grasses are liable to give trouble backsetting is preferable to breaking; for breaking done early allows the grasses to get possession of the field, and it may be more advantageous to backset. Advocates of backsetting claim that it will yield better crops than if the land is broken only. In some respects this is true, if after the first crop is removed the second plowing is done the following spring; the plow will reverse the sod. Owing to the open space the moisture quickly evaporates before it can be put in condition. Drying winds and lack of rainfall may be expected in the spring, and it may not be possilbe to provide a suitable seed bed. When the sod is reversed by the plow it is almost in the same condition as when first broken up, and will require more work and time to fit it properly for the seed than is possible, owing to the drying condition.

The second plowing after the first crop is removed is best done in the fall, as at that time conditions are more favorable than in the spring. The disc harrow should follow the plow; give a double disking, then harrow. The number of harrowings depends upon the condition of the soil. Afterwards should came the plank drag. If a cultivator is used on the farm, the field should be given one stroke with the narrow tooth, about two or three inches wide. The land may be left this way to go into the winter. If the cultivator is not used, a stroke of the

harrow will be sufficient. In using the cultivator care must be exercised to go only about two inches deep. When the field is treated in this manner good results may be expected at the second cropping, and in the following seasons the results will be equally as good as from backsetting.

Breaking has one advantage over backsetting in that only one plowing is done, and on backsetting the extra cost of the second plowing must be considered. Conditions may be dry at the time of second plowing, and this makes hard work for the teams. While I would not make any claim that breaking is more satisfactory than backsetting, I feel that with the present scarcity of labor it will be more economical and profitable than backsetting, especially where the native grasses do not interfere. If the suggestions for breaking in proper season, and for the operations to fit the soil for the seed, are followed, there is not the slightest doubt that a fine yielding crop capable of withstanding considerable drought will be the result.

Breaking Prairie Sod

Whether breaking or backsetting is practised, the following suggestions for fitting the soil for the seed will apply. The first consideration is the best depth to plow. To provide a bed for the seed, it is essential to plow deep enough to obtain two inches of loose, mellow soil at the surface—at least four inches or five inches deep; when the plowing is three inches or less in depth it is not possible to obtain the two inches of mellow soil at the surface.

The sod should lie over flat and, in plowing care should be taken that no misses are made. If the plow goes wide

or is thrown out by stones or roots it is advisable to turn around and go at it again, so that all the field is plowed as uniformly as possible. Remember that it all depends upon how the sod is first plowed as to whether the succeeding crops will be good and profitable. Done badly or unevenly, with some portion missed, the bad effect of such breaking will show the following season.

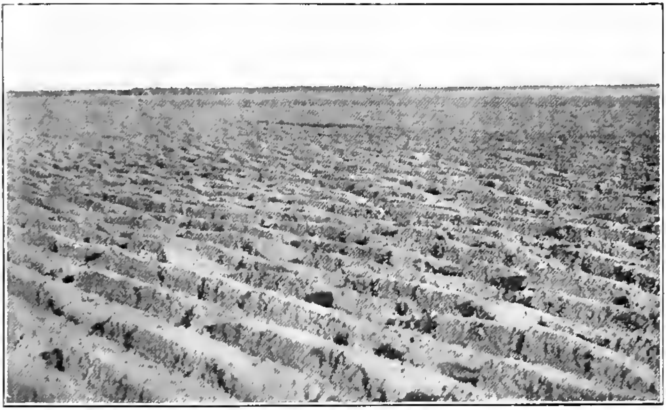


Fig. 12.—Well Broken Prairie Sod.

When it comes to plowing the second time the plow again will skip and run out where spots have been missed, resulting in grassy spots in the field. I would emphasize that the first breaking-up of the prairie sod has a great influence upon succeeding crops. Plow well and get good crops; plow badly, uneven crops.

Cultivating After the Plow

As to packing the field as soon as turned by the plow—that can be left to the judgment of the operator. Pack-

ing induces quick rotting of the sod; but, on the other hand, if the native grasses are liable to give trouble, packing only aggravates conditions. After the plowing is completed, the disc harrow should be used, following the first rain or while the sod is moist—this to prepare the seed bed.

In using the disc harrow take care to avoid reversing the sod. The disc harrow should operate the same way the field was plowed, and it should be set at an angle to loosen the top two inches of soil. If the edges of the sod are not pressed down by packing, then the disc in the first operation of double disking will slice off the edges of the sod, all of which is desirable, as it will afford the soil to make the seed bed. If the furrow slice has been pressed down flat completely it may be necessary to disc more times than if the edge was left lying up.

After the field is double disked, use the plank drag, operating same at an angle as described in Chapter V. The operation of the plank drag will roll the strips of sods that are cut off by the disc harrow along the front edge of the drag, so that by the time they get to the end of the drag they should be completely pulverized and pulled to pieces. The action of the drag also shaves the surface, cuts down edges and fills inequalities or hollows. The work done by the plank drag at this time cannot be duplicated by any other implement with which I am acquainted. Only one operation is necessary, and in addition to the service just mentioned, the drag prepares the way for the final work which has to be done. The drag will leave the surface more uniformerly level. If one more disking, either single or double, is given at this time the disc is able to cut at an even depth over the surface, loosening up the top soil

for the seed bed. Please note that all these operations are done in line with the plowing.

Keep the Sod Flat

It is doubtful if there is any advantage in the common custom of using the disc harrow at the second or third disking straight across the field or diagonally. Cutting the sod in squares or cutting so deep as to invert some of the sods should be avoided.

Fig 13.—Breaking Brome Grass Sod.

The lower portion of the sod should be flat and the top two inches loosened up. This will allow of continuity with the soil below and of capillarity. Using the disc across or diagonally may lift some of the sod, and this is to be avoided. If going in the direction the land was plowed, the disc has a tendency to pack the sod in place. After the field is disked, a stroke of a cultivator, equip-

ped with narrow points about two inches in width, will be found beneficial.

In most cases the foregoing operations after the field is plowed will be sufficient—double disking, plank dragging, a single disking and then harrowing or a stroke with the cultivator. These operations will give excellent results with a minimum of labor.

The most important point to observe is to have the plowing deep enough to allow of two inches of loose soil at the surface. This is the seed bed, the lower portion being firm and lying close to the soil below.

In the spring, before seeding, the field should be harrowed to warm and aerate and loosen the seed bed. The seed should be sown about one inch deep and surface packed after the seeder to induce quick germination and rooting early in the season.

Breaking and Backsetting

Where backsetting is done the sod should first be plowed shallow, about 1½ to 2 inches deep, and as thoroughly as possible, with no spaces left unplowed. Where the land is stony or uneven it may not be possible to avoid some unplowed spaces. It is more difficult to break shallow and make so complete a job as when plowing deeply, as the plow is more likely to skip depressions and go deeply on rises or small knolls. In these cases, to ensure a good job, it may be advisable to go a little deeper.

The sod should be packed as soon as possible after plowing to hasten the rotting. As soon as it is sufficiently rotted the sod should be inverted by the plow. The packer makes this work easier. Plow about six inches deep. The plowing should be disked as soon as possible,

plank dragged and harrowed or cultivated in the same manner as outlined for breaking.

When one wants to do only a small area—say an acre or two—the following method will give good results, using a walking breaking plow: First, plow a thin slice of the sod; then instead of turning over another slice of sod, adjust the clevis in the plow to allow the plow to go in the furrow. Turn up a furrow from four to six inches deep. Later in the season disc once or twice. and follow the same directions as for breaking and backsetting to get the land down in condition. This method is only practicable for such small areas as seed plots or gardens; but it will give good results. One of the best fields I have on the farm to-day was done in this manner nearly 20 years ago.

CHAPTER IV

Weeds and Their Control

What is one of the chief causes of low crop production? Ask me that question and I would not hesitate for a reply, not for two seconds. I would say "WEEDS!" I would say it in large type if I were writing, and in a loud voice if I were talking, and there is scarcely a farmer in Western Canada who would not join in the chorus. For it is well known that weeds take heavy toll of the crop throughout the country every season. Where grain is grown it is next to impossible to eliminate them all. They can, however, be so kept under control that loss from weeds can be reduced to a minimum.

The problem of eradicating weeds is a grave one at all times. Give weeds an opening by a short period of neglect and they will move in and take possession of the land; once they have obtained a stranglehold the crop is done for. The problem is not one that can be left to the Weed Inspector. Every grain grower should be his own weed inspector; for upon the individual efforts of every tiller of the soil depends the result of his fight for possession of the crop.

Because weeds may not seem very much of a menace for the first year or two on new land broken up, many

a man has neglected them to his cost and thereby missed his greatest opportunity for keeping them in check. He loses sight of the fact. perhaps, that even if his land is comparatively clean the weeds are creeping in upon him from many directions; they come in the seed. on high, drifting winds, in old machinery, by means of birds, animals, etc. Older cropped lands are always more infested by weeds unless more than average care has been taken.

The weeds with which we have to contend chiefly may be put in three classes. First, the ANNUALS, which begin and end their life in one season—the most common of these are Lamb's Quarter, Wild Buckwheat, Wild Oats. some Mustards. etc. Second. the WINTER ANNUALS, which are true annuals when they germinate in the spring, but which may also start into life, live through the winter, and after ripening seed, die—they include Stink Weed, Shepherd's Purse. Blue Burr, Pepper Grass, etc. Third. the PERENNIALS, that live for many years—the most persistent of these are Perennial Sow Thistle, Canada Thistle, Sweet Grass, and Couch Grass. There are some other weeds, but the foregoing list is sufficient.

In dealing with weeds it is necessary to have some acquaintance with their habits of growth and the effect on the crop. A different treatment is required for each class; the cultivation given one class for eradication may merely aggravate the conditions in another class. So it is necessary to know something about the characteristics of the weeds one may plan to attack. The secret of successful weed fighting is first to make them grow, then destroy them; the main difficulty is to get them all to grow at the same time, and therefore the best that

can be done sometimes is to control them so that a satisfactory crop can be grown.

Wild Oats

As far as grain growing is concerned, if we have a worse kind of weed than the Wild Oat I do not know of it. Severe treatment is necessary. Being of the grain

Fig. 14.—Showing Field where Wild Oats got Control Early in the Season.

species, its nature makes it a hard weed to eradicate totally. The Wild Oat revels in the shortness of our growing season, as it ripens its seed sooner than any grain crop, with the exception of winter rye. Therefore, where winter rye can be grown there is opportunity of combating the Wild Oat very successfully, as the treatment of the soil previous to seeding this crop encourages the weed to germinate in the fall, to be destroyed later

by frost. A crop of winter rye, well established, will crowd out the Wild Oat the following spring, as the weed makes little growth in this crop.

On restricted areas, a badly infested field of Wild Oats can be cleaned up by seeding to alfalfa or brome grass. These crops can be cultivated early in the spring and again after the crop is cut, and each time it is cultivated

Fig 15.—Showing Field of Wheat Free from Wild Oats. This field was sown at the same time as the one shown in Fig. 14.

some Wild Oats will come up to be destroyed when the crop of alfalfa or grass is cut. As these crops can be laid down for a few seasons before plowing them up again, one can expect to clean some portions of the farm.

Where continual grain growing is carried on probably the best thing to do is to seed down to green feed, either oats or barley, to be cut before the Wild Oat is so far advanced as to ripen any seed.

Where crops for grain are to be grown, the best plan is to shallow plow about two inches deep in the fall. The earlier this is done the better. Many Wild Oats will germinate, and though some may not show above ground, even these will be killed by the first hard frost. In the spring, if the land is to be fallowed, what growth is made during seeding operations may be plowed under when plowing the summer fallow. When this is done the Wild Oats should not be allowed to get much headway for the reason that if they are thick on the ground they will use up the moisture so that the soil will get hard and compacted, in which case plowing may not cover easily because the furrow will break in turning over. The plowing should be done before the soil dries out to enable the plow to turn the weed under completely.

In some seasons one can give this treatment for a spring crop of barley, oats, and sometimes wheat. When this is done it is important that the Wild Oats shall get through the gronnd and into leaf, if only a few inches high. If they are just beginning to show up and are plowed under they will continue to grow, pushing their way through the soil, even if upside-down, and get ahead of the crop. So it is very important not to plow until practically all the Wild Oats get out in leaf.

Growing corn for grain, where practicable, and for forage, will help considerably in eliminating the Wild Oat, as this treatment of the soil by shallow plowing in the previous fall and again in the spring before seeding the corn crop, together with the cultivation given throughout the season, will clean up the land for a crop the following season. Corn seeded on summer fallow is

better still, and good crops of wheat or other grains may be grown profitably after it.

Other Annuals

Lambs' Quarter, Wild Buckwheat, and the other annual weeds, may be combated more easily. But while they are easily destroyed, if taken at the right time, these weeds often take heavy toll of a grain crop. Fields of summer fallow that promised good yields early in the season are sometimes reduced in yield from 50 to 75 per cent. by them.

These weeds make most growth early in the spring and on summer fallow land, to be cropped to grain, may be destroyed by cultivation previous to seeding. At any time after the crop is sown more of these weeds will have germinated and may be destroyed easily by the harrows before the crop is too far advanced. (See Chapter VI—Harrowing Growing Grain.—Page 90). Once the crop is well established these weeds have little chance to hold it back. Shallow cultivation the previous fall for all crops may be done to encourage these weeds to grow in order that they may be destroyed by plowing.

Winter Annuals

The weeds coming under this classification will require special treatment. They show up at all times throughout the season in different stages, from the small plant just pushing through the soil to the plant in flower and seed. They do most harm in summer fallow crops when neglected; there is evidence of this every season. Practically all the Winter Annuals have a fleshy tap-root, and they use up considerable moisture.

Because the seeds which start into life in the late fall are very insignificant they are often overlooked. In the following spring they continue growth, and early in the season, being already rooted, reach the blossoming stage and seed. Flowers and seed may be found at the same time. They drop their seed early while the grain crop is only covering the ground, ready to start into growth at the first opportunity.

Fig. 16.—Winter Annuals are in Control of this Feid. Weeds have almost crowded out the grain. See. Fig. 17.

When they get a start on the summer fallow in the fall and are not destroyed while small, there is trouble in store. If the fallow is seeded without any preliminary cultivation many weeds are left growing; while the seed drill's passage will destroy some, it will not get them all, nor will the harrows always destroy them. In fact, the growth of these weeds is encouraged, and it is their nature to spread their leaves close to the ground and

send up a seed stem. Often they cover the ground so thickly that the grain crop is crowded out and the moisture in the soil used up at the very time the grain requires it. There is no place for grain and these weeds in the same space, and the fight for possession ends in favor of the weeds every time. Their effect on the soil is harmful.

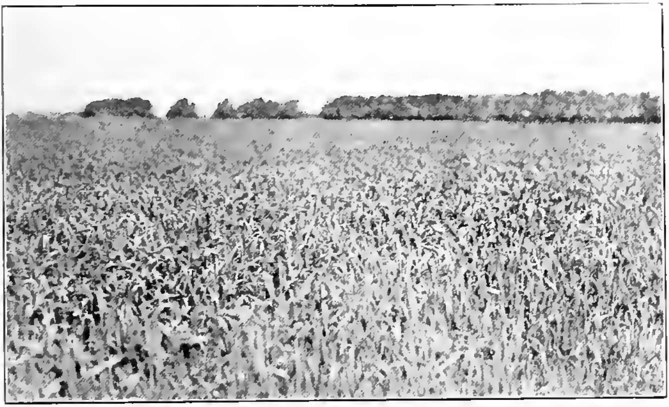


Fig. 17.—The Grain is in Control of this Field.
Photo taken only a few yards from that shown in Fig. 16. Winter Annuals were destroyed late in the previous fall.

Now, it is during this season of dry conditions that the grain crop needs the moisture to develop a strong, healthy plant, as already stated. The heads of the grain are formed early—long before it comes into the shot blade; the number of spikelets and the number of possible grains per head is determined at this early stage, and these in turn determine largely what the yield will be. Given space, sufficient moisture and favorable growing conditions, the grain plant will send up several stems

which will increase in size and number according to the condition of soil, heat and moisture. When the plant is crowded out by the Winter Annual weeds it usually sends up a single stem, with a very small head, and the possible yield is decreased considerably. Even if rains are frequent and weather conditions favorable, the grain plant cannot benefit because the weeds are there to absorb everything. In using up the moisture they harden and compact the soil surface so that when rain does fall it often fails to penetrate.

Among the most harmful of the Winter Annuals may be mentioned Stink Weed, or French Weed, Shepherd's Purse, Peppergrass, Yellow Whitlow Grass, Crossfoot (Naline), and Blue Burr. Once these are established in the summer fallow crop the only remedy is to plow them under. The surest and safest method is to cultivate them out of the soil, root and branch, previous to seeding, preferably in the fall; if not then, in the spring.

While these weeds are most persistent once they are established in a grain crop, they are very easily destroyed if taken at the right time, as advised in the chapter on the Summer Fallow. See Chapter VII—Summer Fallow.—Page 99). When attacked in this manner another crop of weeds may germinate after the grain crop is sown, and these can be destroyed by harrowing at the time the grain is coming through the ground. (See Chapter VI—Harrowing Growing Grain—Page 90). If further weeds come up afterward they will have little or no chance, as the grain crop will then be fully established in the soil.

It is possible that many farmers may be unfamiliar with these weeds; but there is no telling when it may be

necessary to deal with them. It is well, therefore, to be constantly on the watch for the Winter Annuals.

The treatment on Fall Plowing is similar to that described for summer fallow. Where they show up on spring plowing for crop they may be treated as Annual Weeds. In some districts French Weed is exceptionally persistent, calling for special treatment.

Perennial Weeds

In this class the most common weeds are the Perennial Sow Thistle, Canada Thistle, Couch Grass and Sweet Grass, all of which are too well known to need description. They call for different treatment than the Annuals and Winter Annuals. They must be destroyed before the grain crop is seeded, as there can be no possible treatment afterward.

Where these weeds are established the effect on the grain crop is similar to that caused by the Winter Annuals. Being well rooted in the soil at the time the grain is sown, the cultivation given by the seeding operations encourages a rapid growth, so that the grain crop is crowded out. Often where grasses are already growing the grain drill cannot penetrate deep enough to put down the seed, with the result that the crop is patchy. Where summer fallowing is done these grasses may get established; in this case, if there is only an isolated patch in the fall, it should be plowed shallow late, exposing the roots, which will be gathered to a considerable extent by a tooth cultivator followed by the harrows. Sometimes when this is done a complete job of the weed clean-up is made, this depending upon the individual effort expended. In any case, it allows the seeder to put the seed down the required depth and gives the grain a good start

by checking the growth of the grasses until the crop is established.

When the whole field is covered by patches in the fall, it should be shallow plowed, about two to two and a half inches deep, and treated in the same way as above set forth. All other weeds will be destroyed in the same process. The packer should not be used after the field is plowed, but the field may be left in the condition attained by use of the cultivator and harrows.

Under these conditions the grain crop may be seeded early in the spring without preliminary cultivation before seeding. This method is the best I know of for treating grasses that show up on summer fallow towards the end of the season. Disc harrows seldom give good results in the eradication of grasses here, and unless judiciously used may undo the good work previously performed. It is not good practice to use the disc harrow too deeply late in the season on summer fallow.

When these grasses are in evidence previous to fall plowing for grain crops the field should be plowed deeply, two or three inches below the roots, and prepared for spring seeding.

For spring plowing one can grow a satisfactory crop by the same method. Turning up a few inches of soil from below the roots, one can prepare a seed bed and sow the seed above the roots. Thus the grain will get well established ahead of the grasses. I have never known this method to fail in growing a wheat crop, and oats and barley will give even better results than wheat.

It would be well to point out that in every case the plow must go at least two or more inches deeper than the roots of the grasses; but as the latter are shallow feeders there is no great difficulty in doing this.

Eradication of Sow Thistle

So far, fortunately, I have had no experience with Canada Thistle, or Sow Thistle. The following extract from a Manitoba bulletin on the control of Sow Thistle gives the methods that have recommended themselves in districts where farmers have had considerable experience with this serious pest:

"The only system of cultivation that will control the sow thistle, and at the same time give profitable crops, is the frequent use of the bare summer fallow. To eradicate the thistle from the land under fallow, it is necessary to work the land much more than has usually been done. This extra cultivation, however, is not lost, because it insures a much larger yield of grain the following season. There is also less danger of the grain lodging from excessive cultivation than in past years, because Marquis wheat is shorter and stiffer in the straw than Red Fife.

"The whole secret in an effective summer fallow is to work only an area equal to the horse power on the farm. Forty acres summer fallowed correctly is better than one hundred acres poorly fallowed. It is difficult to estimate the amount of land that can be worked by a horse unit because the kind of soil and the annual precipitation play such a large part. However, under normal conditions and in a clay loam soil, a horse for ten acres will insure a well-worked fallow—that is, forty acres for every four-horse team.

"The following are general methods of working the bare fallow that have proven successful in the Red River Valley:

"Summer fallow by the use of only the cultivator.—Some farmers report good results from fallowing on loamy soil by using the duckfoot cultivator in the stubble, and not plowing at all. The advantage of this method is that the soil is firm and the roots are cut off more easily. The greatest disadvantage is that it is difficult to cultivate the first time, because of the stubble

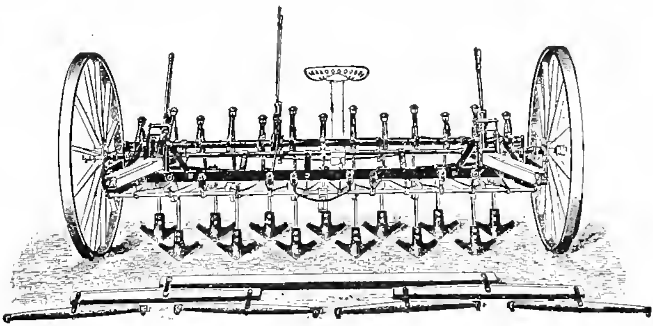


Fig. 18.—The Duckfoot Cultivator is Indispensable in Controlling Sow Thistle.

clogging up the cultivator. When this method is adopted, the cultivator should start early before the weeds have made much growth. The cultivation should be across the dead furrows, so that the cultivator feet will drop into the bottom of the furrows and thus prevent the weeds growing in these depressions. The first cultivation should be as shallow as practicable, and each succeeding cultivation about one inch deeper. By this method the share finds firm soil to work in each time and eventually cultivates the land to a good depth. The field should be cultivated frequently enough to prevent the thistles forming green leaves. Cultivation must be

continued until freeze-up or until the plants have ceased to grow.

"Summer fallow by plowing deep in the fall.—Where only sow thistle is troublesome, plowing the land four to six inches deep in the fall, and cultivating the following summer, has proven very satisfactory. The plowing in this case is usually done just before freeze-up. It turns the roots up near the surface, and at the same time loosens the soil from them, so that the frost can act on the young shoots or buds and kill them. The cultivation the following spring should begin as soon as the weed starts to grow. One advantage of this method is that the attack on the weed begins early in the season, and it is often killed before harvesting or threshing commences. If wild oats are in the soil, however, this method will not control them as effectively as the following one.

"Skim plowing in the fall.—When the sow thistle seed has blown into the land during the late summer or early autumn, skim plowing or disking in the fall will be found beneficial, as these seeds germinate in the fall and the plants (roots and top) are killed by the frost. The light plowing or disking will not affect the old roots, and so in a badly infested field the main struggle begins the following spring. If the fight is to be successful, the land should be plowed early in June about four to six inches deep, and, if necessary, packed immediately after the plow. The cultivators should then be used to keep the plant from forming green leaves. This kind of cultivation should continue until the weeds are all killed or until freeze-up.

"Plowing only once in the spring.—It frequently happens that there is no time for fall cultivation of the land intended for summer fallow. Where this is the case, the

plowing will have to be done the following spring. Usually when everything is considered, such as conservation of moisture, the plowing should be done early in June and the land cultivated as outlined in the preceding paragraph. If the field is not large, or there is a large force of plows, it might be advisable to postpone the plowing until the weed is nearly in blossom. The whole aim of the plant is to perpetuate itself by seed. When the seed is forming, it is drawing heavily on the food stored in the root, so that after the early spring-time, the plant is at its weakest stage about this time. In most instances, however, this is a dangerous method, because some of the seed may ripen and the land become re-seeded. After the land is plowed, the cultivator should be used as in the previous methods.

"Plowing twice during the season.—The system of plowing the land twice or three times during the season is not as effective as plowing once and surface cultivating. This is largely because the weeds are given a chance to grow between plowings, and, therefore, cannot be starved out.

"Subsequent treatment.—If the season has been dry and the work thorough, any of the first four methods should clean the thistle out of the land in one season. It will not, however, be a guarantee that no weeds will appear in the second or third crop, because the seed will be coming in and new plants starting. It will, on the other hand, insure one clean crop and one profitable crop. If the cultivation was not thorough the old plants will give trouble the following year. This is true also if the land happens to be wet, because cultivation of land in this condition only cuts up the roots and scatters them so that it appears to do more harm than good. If for

any of these reasons the weeds have not all been killed, the land should be planted to corn or some other hoed crop that can be intertilled the following year."

Eradication of Canada Thistle

For the eradication of Canada Thistle the following methods are recommended in a Manitoba bulletin entitled, "Lessons on Weeds":

1. Plowing fallow in July and cultivating weekly with the duckfoot cultivator.
2. Deep fall plowing to allow the frost down to the roots.
3. "Topping" in grain when it is in full bloom and hollow stem, seriously checks it.
4. Piling straw or manure on tops of thistle.
5. After harvest, cultivation to kill germinating seedlings.
6. Growing Brome grass after thorough cultivation.
7. Growing winter rye and turning down in spring for green manure, or cutting early to permit midsummer cultivation.

The Plow and the Duckfoot Cultivator

The most satisfactory implement to use in the treatment of perennial grasses and thistles is the plow, together with the duckfoot cultivator; use as large a size of blade as possible. There are different styles. Some are similar to the cyclone weeder. Any implement that can pass freely through the soil below without turning it up or going too deeply is most effective.

There seems to be a general impression that it is necessary to have the knives or blades sharp in order to cut. This is not necessary at all. More effective work is done

by tearing out the roots; where volunteer grain or wild oats are concerned, cutting off below the surface does not stop growth. They must be taken out below the root or pulled out by passage of the implement in use.

Do not overlook the fact that any weed can be destroyed if it is prevented from coming into leaf. One should not wait until a fresh growth is made when dealing with perennial weeds. Go to work before they show up again and give them no chance to get into leaf. It is through the leaf and stem that plants live and grow. The time to get all weeds is in the early stage; once firmly established, severe treatment is called for at a time when other work is pressing. Therefore the easiest, and most effective, time to get after the weeds is when they are very small and can be destroyed by the harrows.

Wind as a Factor in Spreading Weeds

The fact that wind is a factor in spreading weeds on the prairies is indicated by the results of an investigation conducted by the Seed Branch of Ottawa a few years ago. It was shown that an Alberta field, seeded one year to Timothy and Alsike Clover after a barley crop, without summer fallow for eight years previous, contained from 20 to 240 weed seeds in a surface square yard one inch deep. A field which had been under a good system of cultivation and rotation contained 4 to 984 weed seeds in a square yard of surface soil. Samples taken along a road fence in Saskatchewan showed weed seeds at the rate of 136 to 833 per square rod of surface soil, 1 to 812 at a depth of two to three inches, and 906 at a depth of five to seven inches.

CHAPTER V

The Plank Drag

Because I consider a plank drag indispensable on the farm I am devoting a special chapter to it. Perhaps I should say *the* plank drag, because there are different styles of home-made drags often used on the farm, and the one I am recommending is a special kind which I have evolved from long experience. I propose, therefore, to state my experience in the operation of this particular plank drag and give full instructions for its construction and use.

It is many years ago now since I first used a home-made drag. That first drag of mine was made by hewing a flat side on a poplar log—two logs, held in place with wooden pins. I used it with the flat side to the soil and when drawn straight the effect was to crush the lumps. Other styles used, although of different construction, had the same effect—to crush the lumps. I soon found out that better work could be done when the drag was drawn down the field at an angle. From this discovery I finally was led to the construction of a different plank drag, which has proved so satisfactory that I have used it ever since.

How to Construct the Plank Drag

The plank drag that I recommend is made of two-inch plank, 9 feet to 10 feet long, no longer. The planks are set upon edge and placed three feet apart, the ends overlapping about a foot or 18 inches. In average soils the two-inch plank will do; in heavy soils or under certain conditions four by eight-inch plank may be used, but for old lands and medium soils a two by six-inch or two by

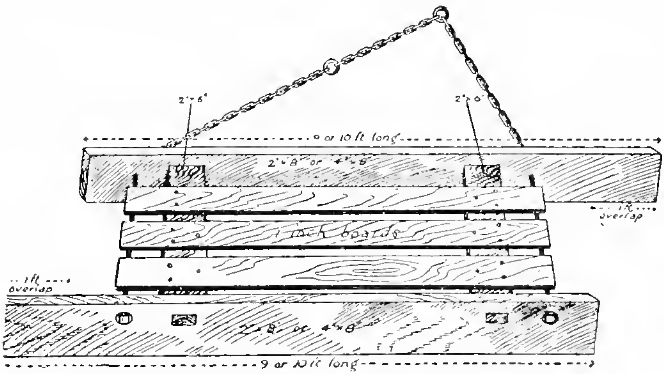


Fig. 19.—Showing the Construction of the Plank Drag.

eight-inch plank is heavy enough. For good work the drag should not be made longer than 10 feet, as this size is large enough for the average team. The number of horses required to pull it is regulated by the work to be done.

The planks are held in place by mortising two by six-inch pieces three feet long into them near the top edge—one at each end, and, preferably, another in the centre. The drag must be made rigid. Boards are nailed on to make a platform on which the driver can stand.

In constructing the drag be sure to dress the front edges of the plank. Do not leave them rough. Also be sure that the bottom edge is level. In setting up the planks choose a level surface before putting them together. It is not necessary to lay the platform boards close together as long as they are close enough to prevent the driver's feet from slipping in between as he stands on the platform.

Now, regarding the pull. The team may be hitched to a chain fastened on the drag, or a good rope will answer the purpose. The pull should come from the top edge in order that the soil may move freely along the front edge. Pass the chain or rope under the crosspieces of the drag. If fastened otherwise, particularly in the case of a chain attached to the front plank, the soil will gather and hold. The hitch for the clevis is shorter on the right-hand side, making the other side longer, so that when the team pulls the drag it is drawn at an angle of about 40 degrees. At a more acute angle than that the drag will pull sideways. It should not be pulled straight.

The reason for this is plain. Drawn at an angle, the drag shaves the surface of the soil, which runs along the front edges and drops into any light depression, while the higher portions are shaved off to some extent. This tends to uniform the surface of the soil, and uniformity of the root and seed bed is very important.

Value of Uniformity

A uniform seed bed allows the seeder to plant the seed at a uniform depth, ensuring more uniform germination and growth, more uuiform ripening—in short, a more uniform crop that will cut into uniform sheaves. Also a smoother surface is attained upon which the

binder can operate more satisfactorily. On an uneven surface the binder will swing when the grain wheel meets any small obstruction and this causes the grain reel to throw the grain on the tables indiscriminately, resulting in ragged sheaves; with the binder running smoothly it can tie neater and more compact sheaves.

The benefits of plank-dragging the soil are not confined to the binder alone. The plow with the wheel running smoothly will turn an even furrow at a more uniform depth. Likewise, the harrows and other implements used on the plowing will operate more uniformly. The seed drill will run more smoothly, dropping the seed at an even depth; the feed of the seed is more regular, less jerky than when the wheel is travelling on a rough surface. Every implement used on such land will operate more satisfactorily.

This plank drag that I am describing will do work on the soil that cannot be duplicated by any other implement. And as it is so cheaply and easily constructed it is possible to use more than one if the work to be done requires it. There is a vast difference between soil made smooth and soil made uniform; the object of this plank drag is not merely to pulverize the lumps and make the soil smooth, but to make it effectively uniform. Other styles of drags, or "floats" as they are often called, will make a surface smooth while the roller also will press down lumps; but none of these gets results like the plank drag on edge. When a field has been rolled it may present to the casual observer the same effect; actually, however, there is a big difference as the roller or float cannot move any soil and thereby become surface levellers.

When to Operate the Plank Drag

To begin with, the plank drag may be used to good purpose on any land that has been plowed—breaking, backsetting, summer fallow, spring plowing, fall plowing or in preparing garden land. It can be used after a potato crop is planted or in preparing land for any grain crop, corn, potato or similar crop. It is very

Fig. 20.—Packer followed by the Plank Drag just previous to Seeding.

useful where alfalfa, clover, grasses or other forage crops are to be seeded. On new breaking it will do work which no other implement can accomplish. (See Chapter III. Breaking and Backsetting. Page 57.)

It is not good practice to leave any land with the surface too smooth—as the roller leaves it, for instance. This will only facilitate the movement of water to the surface to evaporate. When the plank drag is used

previous to seeding this smooth condition is broken up, providing a mulch.

When the plank drag is used on fall plowing, summer fallow or other land not to be seeded immediately, the land should be harrowed or cultivated to break up the capillarity and restore the proper mulch. It must be understood that the drag should not be used when the soil is too wet, as this may spoil the texture of the soil in the seed bed; the drag operates best when the soil is fairly dry on top.

In the spring, after the plowing is done and the land is ready for the seeder, the plank drag will operate freely. Although the surface is dry the moisture will come up to the surface so that the seed can use it to advantage. Reference to this drag and when to use it with best results will be made in dealing with the different phases of soil tillage.

It will be noted that the plank drag is always used after the plowing has been packed down, it not being advisable to use it directly after plowing; the reason is that it will dig down into the loose soil, gathering rubbish.

How to Operate the Drag

In operating the plank drag the driver should go up the right hand side of the field, cross at the end, then instead of going across the ends to the other side of the field, he should go only to the first dead furrow and work the field in sections.

As already stated, the best work is done when the soil at the surface is dry or not too wet. The surface packer leaves it in just the right condition as the drag moves only the soil at the top. When the soil is fairly

dry the drag will move it freely along the front edges to the outside end; if there is a hollow, the soil will drop into it and the drag pass over it and if a slight knoll or elevation is encountered the drag will shave it off.

If it is desired to fill up the dead furrows, the driver starts on the right hand side of the furrow, keeping the end of the drag just in the furrow so that the soil will run along the drag and drop into the furrow. At the end of the furrow the driver turns around and comes down the other side of it, filling in that side in the same way. Then the section between the dead furrows is done. If it is desired to change the angle of the drag's operation this may be done by the driver simply changing his position on the platform where he stands.

Warning has been given not to use the drag where the soil is heavy and wet, as this will compact the surface and facilitate evaporation, so that the soil will bake.

Any time after a field is disked the plank should be used to pull down the ridges left by the disc harrow. The drag may be used to good purpose on any plowing before planting a crop and on soils that are lumpy; also, as already stated, it may be used after a crop of potatoes is planted or just previous to planting a corn crop alfalfa, clovers, grasses or on garden land.

Always have in mind that any fields which are dragged should not be left in that condition unless for a special purpose. Thus, it is good to leave a planked summer fallow for a short period to encourage weed growth, there being more surface exposed to the heat and therefore an encouraged germination of weeds. Should a rain fall it will enter the ground easily. The ground should be broken up as soon as advisable by the harrow or the cultivator.

CHAPTER VI.

Harrowing Growing Grain

There are conflicting opinions about the advisability of harrowing growing grain, the operation being more or less in the experimental stage in Western Canada. Some will advise harrowing at a certain stage of crop growth; some say the harrowing should be done with the rows while others advise harrowing across the rows; some claim it is beneficial and others deny this. Those who advise harrowing grain after it is above the ground often do so without giving any details; so that there appears to be no safe rule to go by. Many who would harrow their crops are afraid to try it. And thus it goes.

It may be stated at once that anyone who puts the harrow on growing grain simply because he is advised to do it, who does it without any definite purpose in view and at any time convenient, is likely to be disappointed with the results and inclined to condemn the practice. On the other hand, he may happen to go on the field just at the proper time and obtain such good results that he will advise all his neighbors to harrow.

There should be two objects in view in harrowing growing grain—namely, to destroy weeds and to maintain a mulch. The more important consideration is the control of weeds and in doing this a mulch will be

maintained. Thus, apart from the question of weeds, the cultivation received by the harrowing is beneficial to the crops. It is not necessary to perform the operation for the conservation of moisture, except in certain districts, as during the period when grain may be

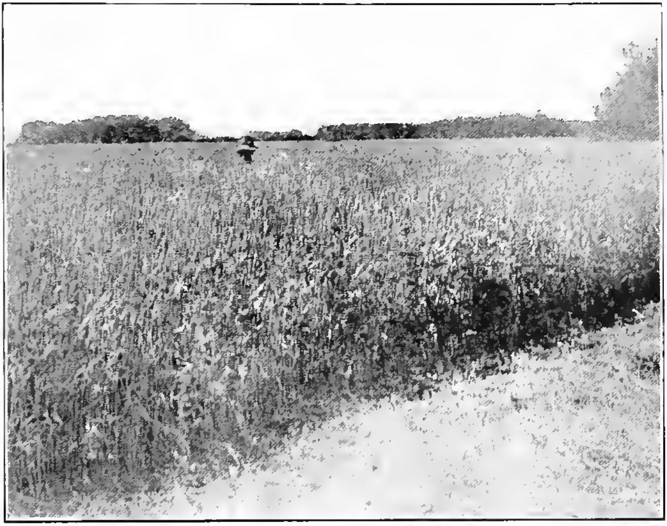


Fig. 21.—Harrowing after Seeding did not Injure this Field. Kitchener Wheat, yielding 63 bushels per acre, harrowed four times after the crop was up.

harrowed we rarely have rain heavy enough to form a crust.

After many years' experience in harrowing grain at different stages of growth and condition of soil and season, I have found that there is a period when it is beneficial to cultivate the grain with the harrow to keep weeds under control and conserve moisture. Every

kind of crop is benefited by cultivation, but every kind of crop cannot be cultivated at any time. It is not a matter of whims; for the grain crop may be cultivated only at a certain stage of its growth. And until such time as we have special implements to cultivate up to the time the grain is in the shot blade, we must depend upon the harrow to do the work.

The main object being to control weeds in the crop this chapter will deal with that operation only. I want to dispel the general idea that it is detrimental to the crops to harrow. I would point out first that unless one has a full understanding of the operation, he is likely to get unduly frightened and pull off the field very quickly when he notes the apparent mess which the harrow is making of the crop.

Smothering Causes the Damage

It took me many years to free myself from the feeling that I was doing harm to the grain by harrowing it, even after I knew that it was all right. I have made a field so black by the process that the only green portion in the field was that part which had escaped between the harrows. Fields sometimes look pretty sick after such treatment and it is best for the inexperienced to keep away from the field he has harrowed for two weeks or he is apt to worry needlessly. After two weeks the recovery and growth made in the field may be a revelation, particularly if weeds were plentiful.

When a field is very weedy I would advise harrowing even if it does cause damage. It is a case of kill or cure anyway and I would always, without fail, rather take the chances of injury to the crop than let the weeds get beyond control. And where weeds are thick between

the rows of grain the chances are greatly in favor of them controlling the crop.

Another general idea is that in harrowing grain it will pull out and that many growing young shoots will be killed. But there is very little danger of injuring the grain by the harrow. What is harmful is the smothering. While this will not kill the grain out it will retard growth to some extent and therefore delay maturity.

It would be well to point out that it is not possible to harrow any or every field of grain. Preparation should be made beforehand. There are large areas that are too loose to harrow; for when the seed bed is too loose there is a greater possibility of smothering the grain and retarding growth. In every case, therefore, the plowing should be firmly packed before and after seeding, thereby firming the soil around the seed. As the packer leaves the soil in a corrugated or ribbed condition, it is well to harrow with a light harrow to pull down the ridges left by the packer.

Killing Weeds Important

Again, there are many kinds of weeds to be considered. Wild Oats are weeds; but these cannot be controlled by harrowing and this operation will only encourage more rapid growth. There are, however, many other weeds which may be controlled by this method. Winter annuals and some of the biennials and perennials will require special treatment. Where these are in evidence they must be looked after before the crop is sown. They may be found on the summer fallow early in the spring and may escape observation or fail to be considered seriously. Herein lies the danger. French weed, blue burr, shepherd's purse, pepper grass and similar weeds,

as well as mustard, should be looked after early in the spring. They may be destroyed by cultivation of the fallow before seeding. If they are thick, although very small, a cultivator that will cut under the surface is the best implement, care being taken not to stir the soil more than 2½ inches deep. After the field is seeded if any weeds start again they may be controlled by the harrow. (See Chapter IV—Weeds and Their Control. Page 66.) Annual weeds, such as lamb's quarter, wild buckwheat, etc., may be controlled by the harrow.

When to Harrow Growing Grain

There are only two periods at which I can recommend harrowing. The first is just previous to or at the time that the point of the grain is showing up through the soil. The second period is after the plant is well established and shows two or more stems or is in the stooling stage. Too much advice is given to harrow grain when it is from four to six inches high and it is responsible for much disappointment; for when grain is that high it may be harmed, just as at that height it may be benefited, depending upon whether or not it is in the right stage of development.

By taking measurements of the grain from the time it is showing through the soil until it is about six or eight inches tall it will be noticed that the growth is very rapid. This is when it is in the single leaf stage. After it gets that high it begins to tiller or throw out more stems without growing much higher until a little later in the season. When it is in the stooling stage it will stand considerably more harrowing than in the single leaf stage and in the latter stage I advise against

harrowing, the growth being rapid and the leaf tender; as the harrows go through the soil they act as miniature plows, rolling out the soil and covering the single tender leaf so that it is smothered to some extent and its growth retarded. If a heavy shower falls soon after this is done it packs the soil around the leaf, which is apt to turn yellow.

Right Kind of Harrow

By actual experience I find that the most good can be done just at the time the plants are peeping through the soil. Weeds are then very small and tender and a double stroke of the harrow will destroy them and keep them under control until the grain plant is established firmly and in the stooling stage, when it may be harrowed again if necessary.

Frequently the farmer is pressed for time during seeding and in that case harrowing may be done later when the points of the grain are showing. It would be well to advise against leaving the operation too long, however, and therefore the field that is to be harrowed should be closely watched. Sometimes the grain comes up in a single night; if left over Sunday to Monday morning it reaches the single leaf stage and the opportunity is lost.

In harrowing after the grain is in the second stage I would advise going with the drill rows and not across them. There are several makes of harrows suitable for this work. While the heavy diamond harrow will answer if no other is available, the best kinds are the lighter makes similar to the Boss harrow. There are harrows that cover 26 feet at one operation and it is advisable to cover the ground as quickly as possible.

If it is necessary to give a double stroke I would advise coming back in the same stroke instead of lapping.

The best time to harrow is on a warm dry day. It should not be done when the grain is wet or damp with dew.

To dispel any impression that any hesitating grain grower may have in regard to pulling out the grain, I would say that when the seed is planted it first shoots out roots about two or three inches long; it may have anywhere from three to six inch roots before the sprout comes out of the seed. As the sprout pushes up through the soil the rooting of the plant is fairly well established and braced in the soil, especially if the seed bed was well prepared. It would be quite hard even to pull the growing plants out by hand. Some plants will pull out if harrowed in the singe leaf stage; but these are where the seed is very shallow and not firmly established. No grain will be pulled out at the first period of harrowing.

One important point to observe with respect to harrowing a grain crop is that the most important time to eliminate the annual weeds and some of the biennial and perennial weeds that start into life in the spring, excepting, of course, the wild oat and the grasses, is when they are very young, at the time they are just showing through the ground. This is often the case just previous to seeding, but more particularly after the crop is planted. Many of these small weeds are destroyed in the seeding operations, but a great many are not destroyed as they are not disturbed between the drill rows, and many are down below the depth the crop is seeded and show up afterwards. On coming out of the ground they are very tender and not firmly rooted. When they get into the broad leaf stage they are harder to destroy. The most

effective time to destroy them is at this early stage. If it is intended to harrow the ground immediately after the crop is seeded it may be done, but can be done to good purpose after waiting a short period if the seed is packed down by the surface packer. There is no object gained by harrowing immediately after the seed is sown and packed down. This leaves more time to go on with the seeding, and applied to seeding the fallow fall plowing or spring plowed lands that are seeded to a grain crop—also by leaving the harrowing for a time from one to two weeks in a normal season it lessens the chances of the soil drifting.

Should weeds show up before the grain it may be advisable to harrow, but the harrowing should always be done when the points of the grain are just showing through the ground. The effect of harrowing on the weeds at this stage of their growth is to pull some out that are rooted near the surface, break the tender stems of others, so that they eventually die off, and to destroy many by smothering. The passage of the harrows through the soil rolls the soil and covers many weeds, and they will die. I find by a close examination of these weeds that they sometimes take from one week to two or three weeks to do this in a dry spring. Should a heavy shower fall, which will run the soil particles together, they will die more quickly.

By this operation the weeds are either destroyed or kept in check until the grains get well established. The crops cover the ground and keep the weeds that may continue to germinate in check. By a close study I find that wild buckwheat, if allowed to get into the rough leaf, is hard to destroy by harrowing the crop, and it will call

for more strokes of the harrow than it would be wise to give.

Even after two such harrowings are given after the crop is seeded, there may still be more weeds continue to come from the lower depths and may call for harrowing again when the crop is more advanced. But most good is done when harrowed as I have indicated. These are important points that should be given some consideration.

CHAPTER VII.

The Summer Fallow

There are several reasons why summer fallowing is done each season. One of the most important is to have a certain portion ready prepared for cropping in the spring and because with our system of seeding so many acres on stubble-plowed land it is necessary to give the soil a rest. In some districts it is necessary to do this where the annual rainfall is light. In some cases it is because weeds are getting the upper hand. The general impression is that it is done for two objects—conservation of moisture and the destruction of weeds. There are, however, other important reasons why a portion of the land should be summer fallowed, which should not be overlooked. By a proper system of cultivation we may liberate a fresh store of plant food for the crops which are to follow and put off the day of impoverishment of our soil that will surely come if the present system of grain cropping is continued. While this may be best done by a system of rotation, it is not my intention at this time to go into this matter, but rather to deal with the bare fallow system and it will be readily seen that by following a proper system of soil building by

cultivation, the conservation of moisture and the destruction of weeds will naturally be attained.

While it is not possible to lay down a method for summer fallowing that will hold good in every district,

Fig. 22.—Seeding the Summer Fallow.

the one outined may be modified or enlarged on to suit the different conditions of each and every district.

Do Not Plow Late

There are many different methods adopted. Some have a definite plan or purpose in view. Others again are haphazard. The idea that so long as the land is black or that the plowing may be done at any time will not suffice, and the sooner we get away from these ideas the better it will be for the welfare of the country at large. Many fallows are plowed too late in the season. Some of the reasons given are that by plowing late in July it saves a lot of work, because there are few weeds to bother with in the fall at harvest-time; but it

is a different story next year when the crop is growing, because then the weeds are in evidence. Late fallowing is little better than fall plowing and the prime object of summer fallowing is missed. There is no conservation of moisture and the weed problem is increased instead of decreased.

Another method is to seed the plowing lightly with grain to provide feed for stock running on the fallow. While this system saves work, it is not a sound one. It would be more profitable to seed down a permanent pasture for a few years and properly cultivate the fallow because in many cases the soil becomes too compacted and this should be guarded against. What is much more important is a firm, moist, mellow seed or root bed. It is not my intention to criticize this system, because there may be reason in following it; but the chief point to be emphasized in this connection is that we cannot have a fallow and a pasture at the same time. It is neither a good fallow nor a good pasture.

One of the reasons why we should lay by a certain portion of land for summer fallow is to provide against a partial or total failure of crop. If we go back to the season of 1914 we find that during the severe drought in almost every district good crops were assured where sown on summer fallow, whereas on stubble lands, plowed or unplowed, the crops resulted in failure. The reason for this partial or total failure is apparent—namely, lack of moisture for the growing crop. It was not so much lack of rain during the growing season, but lack of stored moisture in the soil. Wherever moisture is stored up in the soil, so that the crop can use it, a fairly satisfactory crop may be brought to maturity even if no rains fall.

Restore Fertility to the Soil

Another important reason why it is necessary to summer-fallow is that continued cropping to grain will decrease the average yields and deplete the soil of its fertility. The argument is put forward that there is so much fertility in the soil that every bushel of wheat or other grain removes a certain amount of this soil fertility and that in time, by continually growing heavy crops of

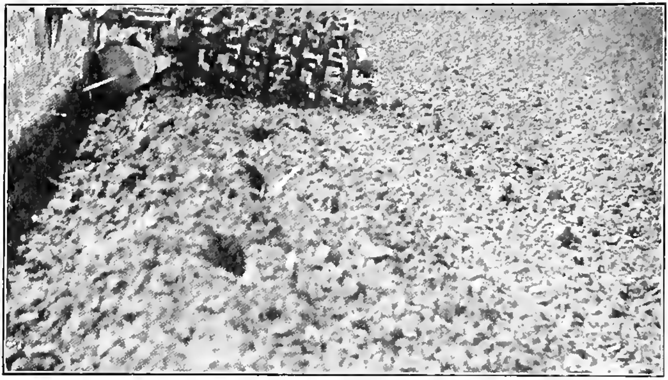


Fig. 23.—The Packer Attachment following the Plow.

grain the fertility will be used up. Theoretically this seems a good argument, but it is not true. The soil is inexhaustible, providing we husband its resources, and it is a fact that we may, by good sound methods of tillage, replace in the soil what the crops have removed.

The slight yearly decrease in our average yields should not be charged against the heavy crops taken from the soil, but to the abuse and illtreatment of the soil by the many slack methods in force to-day. The absolute need of having as much as possible of the seed bed prepared

and fitted for the seed the previous season appeals to me more forcibly each season. It is undoubtedly true that the time is coming when we shall be compelled to change our system of continual grain growing by growing intertillage crops. There are several of these which may be grown profitably which will allow us to maintain stock on the farm and improve our present conditions, but space in this chapter will not allow me to go into this subject more fully.

Summer Fallow Requirements

Before attempting to give some of the best methods of summer fallowing that may prove applicable to most cases. it is well for the reader to have a definite idea as to the requirements of a good fallow. The most important points are: The control of weeds; storing up in the soil as much as possible of the moisture that falls; fitting the soil to receive the moisture; unlocking the plant food or creating fresh available plant food; time to plow; depth to plow and the formation of mulches to retain the moisture.

Encourage Weed Germination

As weeds are one of the most important objects and really come first on the list, this work should already have been started. To control the weeds it is necessary and important to either disc the land or shallow plow the previous fall. If this has not been done already, it may be done early in the spring or, failing that, immediately after seeding will sometimes give good results. Of the two methods, disking and shallow plowing, I prefer the plowing in the fall. Disking, while a trifle more rapid, is not so satisfactory as shallow plowing.

The land should be plowed at a depth of from two to three inches—as shallow as possible so long as the furrow turns over completely. The plowing should be packed and if time permits, plank dragged. (The plank drag is described in Chapter V.)

Harrowing may be left until the spring when it should be given as soon as the land is dry enough to work. The harrowing warms and aerates the soil, and starts the weeds into life and at no time of the season will weeds make such a growth as in the spring.

If only a single plowing in the summer is depended on, as is usually the case, in spite of the rains that fall and the heat, many weed seeds will not germinate, but will surely come into life the next season in the growing crop. Some, such as wild oats, will grow from a depth of six inches or deeper still and land that was black and clean the previous summer will sometimes be the weediest when the crop is growing. The important object we should strive for is to encourage weed germination. It is easier to destroy weeds than to make them grow. By the plowing in the fall we may induce a greater proportion to germinate in the spring than at any other time.

First Plowing Should be Shallow

But if you cannot plow in the fall, do so early in the spring or, failing that, do it as soon as seeding is over; but do so anyway for another reason than the control of weeds. The second plowing will be made easier, especially if conditions are dry, because this shallow plowing acts as a mulch. The soil, too, is in better physical condition to turn under than if only the stubble and dry top soil are plowed under. By the first shallow plowing

method all the small annual weed seeds are put at the right depth to germinate so that they may be destroyed by the second deeper plowing and the water from the melting snow in the spring will soak deeper into the land and is not lost. A stroke of the harrows as soon as the land is dry will conserve this moisture. If the stubble is left unplowed, considerable moisture is lost by being evaporated by wind in the spring.

If the shallow plowing has been done in the fall or early spring, as soon as seeding is over it is advisable to do the second deeper plowing. By the end of May or early in June this should be done for several reasons. It should be done as soon as possible to catch and hold all the rains that fall during June. It is just as important to catch all the moisture that falls as to conserve it. If we lose the opportunity we have less to conserve. If only the single plowing is done and late in the season, a great opportunity is lost. If no preparation was made and the hard stubble that is growing up to volunteer grain and weeds is left waiting for rains to come to make the plowing easy, then the weeds are pumping out what small store of moisture is in the soil and the plowing has to be done at a busy time. Thus the opportunity to catch and conserve moisture is lost.

Plow Deeper Than Usual

It is a safe statement to make that most of the plowing done is too shallow. After several years of plowing and cropping, if no attempt is made to deepen the plowing, the soil becomes loose and spongy and this is the cause of much soil drifting. The humus is depleted and blown away by the winds. A good deal

of it is also carried away by heavy rains and in the spring by melting snow.

By plowing an inch or two deeper and bringing up fresh soil from the bottom, the top soil is buried, forming the root bed and the new soil on the surface acts as a mulch. As the plants do not feed on the surface, this soil is acted on by the elements throughout the season and is forming into new plant food for another season, at the same time as it is preventing drifting of the soil.

The illustration (Fig. 23) shows the finished plowing after the use of the small packer attachment to the plow. I consider this attachment one of the most useful implements on the farm. No plowing, unless under special conditions, should be done in the West without this equipment. Its value cannot be overestimated under our conditions of light rainfall and especially in plowing in the spring. There are several kinds of small packers on the market; some are subsurface and others surface packers, besides harrow attachments. I can recommend the packers as an improvement over the harrows. They are not expensive and will more than repay for the outlay in one season.

Pack the Plowing

After the plowing is done a larger packer, preferably a sub-surface packer, should be used to firm down the furrow slice. This is followed by the plank drag as shown in the illustration (Fig. 20). The effect which it has in levelling the surface of the soil should be noted. After this is done the harrows should be used to restore the mulch. The land can now be left for other work to be done on the farm.

In plowing the fallow, if couch grass or sweet grass is in evidence, it would not be advisable to pack, as this will aggravate conditions. The furrow should be left up rough to dry out the roots during the hot, dry weather. If grass shows up only in isolated patches then these patches may be left unpacked; should the grasses show up during the late summer the best thing to do is to shallow plow them late in the fall, removing as many roots as possible by a cultivator, using harrow points. When dry they may be burnt. Annual weeds that may germinate, or even winter annuals may be destroyed after the crop is sown by harrowing done just as the grain is showing above the ground.

If the land is weedy it will not be long before the weeds are showing up. This operation of handling the weeds and volunteer grain is usually left too long, until the weeds and grain are firmly established and this makes it a more difficult task to destroy them. Weeds or grain should not be allowed to get firmly rooted. If they are handled just as they are showing through the ground the harrow is the most efficient tool to use as it covers a large area in a short time. If the weeds are watched carefully and not allowed to get a footing, the harrow will destroy them. But this operation must be attended to and no other work should be allowed to interfere. The cultivation given by the harrow aerates and ventilates the soil and is continually liberating plant food.

The general advice given is to harrow after every rain, but this is not necessary. If a rain falls and is not heavy enough to run the soil particles together under our conditions the sun and winds that follow a rain will

restore the mulch. The time to harrow after a rain is when a heavy thunder-shower or continual rain thoroughly soaks or lies on the soil as after a sudden downpour. It will then be necessary to harrow again to restore the mulch and conserve the rain that fell.

Use a Cultivator

Once during the season after a heavy rain, as soon as the soil is dry enough to work, I can recommend a pointed-tooth cultivator as an efficient and necessary tool to use. By not allowing it to go too deep this will put the soil in splendid tilth and it is not necessary to follow with the harrow unless weeds are very thick.

I have given the foregoing as a necessary operation to destroy weeds, but the cultivation given in doing so is of great value apart from the control of weeds and is necessary as it is a means of producing fresh plant food by aeration and cultivation. Land that is left in a cultivated condition will absorb all the rain that falls and moisture will enter more easily into the soil to be conserved by harrowing afterwards.

There is one operation I consider of great importance that should be done at the end of the season before the ground freezes. The general rule is to leave the summer fallow level or as the harrows leave the soil. This land goes into the winter in this condition and when the snow thaws off in the spring much water is lost or run off and the soil is left compacted through the soil particles running together, so that when the harrows go on the land in the spring they simply scratch the soil and do not stir it sufficiently. Thus the seeder will not penetrate the soil easily.

By using the pointed-tooth cultivator before freeze-up, by letting it run lightly over the ground it forms small furrows and ridges, so that the melting snow, instead of ruuuing off, will penetrate into the root bed and deeper soil, making a reserve for the crop to draw on in a dry season.

This last cultivation should be left untouched again by harrowing. The object is to have the soil in small

Fig. 24.—A Modern Duckfoot Cultivator.

ridges to allow all the water from the melting snow to penetrate into the root bed and not run off. If there is any slope to the land this cultivation should be made across the slope. The ridges and furrows made by the harrows are not deep enough. Besides holding all the water the harrowing that ought to be given before seeding may be done across the ridges and they will pull down in fine shape. The soil will then be in splendid

condition and the seeder will deposit the seed easily at the required depth.

Now it must be understood that this harrowing will not make the seed bed too loose, as the soil below the ridge will be firm and compact, as it should be for wheat. The value of this operation cannot be overestimated and it ought to be done whether the land is weedy or clean. The soil will be firm below and the ridges when pulled down will form an ideal mulch.

Besides conserving all the moisture the cultivation will destroy many small weeds and ventilate the soil. In the spring again it answers the same purpose. I use a hoe drill with long cultivator points to do this kind of cultivation, but any similar tool will do the same work.

Ideal Soil Condition

If these methods are followed the soil should be in prime condition and tilth for wheat in the spring. An ideal condition of the soil in the spring has been secured when the earth will mould in a lump by a single compression by squeezing it in the palm of the hand, and will fall away again loosely so that the soil separates into fine particles when the lump is subjected to slight pressure between the thumb and fingers. It should not be too wet, but moist and pliable.

Summary

In conclusion it may be well to summarize the above. To have a good summer fallow—that is, land ready for crop which will not fail to give a profitable yield—the land should be shallow plowed or disked beforehand, preferably during the previous fall; if not then at least as early in the spring as possible, either before or imme-

diately after seeding is done. The shallow plowing method is preferred. Next, the land must be plowed deeply as early in June as possible, turning up at least one inch of new soil. Have a packer attachment to the plow. Use a plow that turns the furrow right over. The turn of the furrow is important and should be considered even before particularly straight furrows. The

Fig. 25.—A well-Packed Summer Fallow.

soil should be moist when plowed and not plowed when very dry. The soil will not be dry even in a very dry spell if the ground has been prepared beforehand. The soil should be moist enough so that the furrow rolls over and pulverizes in turning. Follow with a subsurface packer, if one is at hand, or else with a surface packer. Then plank drag and follow with the harrow. Cultivate throughout the season so that no weeds get a start. Do not omit to cultivate with the harrow point cultivator and leave it once in that condition if possible

until a heavy rain falls to catch the rainfall, then harrow to conserve it. Do not omit to cultivate with the cultivator at the end of the season, running the cultivator at right angles to slopes and lastly, before seeding in the spring, harrow it crossways to make an ideal seed bed.

Do not forget that while conservation of moisture and weed destruction may be the main object, it is also highly important to cultivate to liberate plant food, and remember that in doing this you deal with the other objects in view in summer fallowing.

CHAPTER VIII

Conserving Soil Fertility

There is no wish on my part to force my methods on the attention of those engaged in agriculture. Because the method herein set forth is somewhat new and out of line with those methods which are in practice at the present time, I am aware that there are some who may not agree with me in these principles and methods. The ground on which they may base their objection is that these methods will not apply to every district. At the same time I feel sure that the methods herein laid down, if followed as closely as possible, will lead to a better system of tillage and consequently to a more satisfactory return each season than is obtained at the present time.

This chapter will not deal with the soil from a scientific point of view with respect to the formation and all the esential constituents of the soil, but with the more practical part that can be followed and can be worked out every day on the farm. The science of the soil may be left to those who wish to study it, and there are many good books and publications at the present time that may be read and studied with profit. Every tiller of the soil should know something about the make-up of the soil and its requirements.

The tillage operations that I shall outline here are simple and direct in effect and apply to our western conditions, and I want every reader to note them carefully and impress the principles on his memory. While I shall emphasize certain lines of operation, these may be followed as closely as posible to agree with the conditions that may apply to each district. There is no hard and fast rule that may be laid down to suit every condition, and I have carefully considered each and every point and am suggesting nothing that cannot be applied with good results in practically every district. I wish to point out that the following is the outcome of many years of experience in the field and close observation under all of the many varying conditions of each season, coupled with some of the sound principles laid down by competent authorities on the soil, and I am presenting them with this object in view—to set the reader thinking seriously of the possible solution of the problems confronting every farmer.

As the title of this chapter reads "conserving soil fertility," it will deal with the fertility, how much of it is lost each season, how these loses may be prevented, and how to restore some of the fertility. It will deal in part with the root and seed bed, showing the difference between the two. Each has its place and must be properly understood, and while I have already described some of the operations in seeding, the summer fallow and other tillage operations, I shall emphasize some of the most important points.

In dealing with fertility of the soil I shall have reference only to the humus, as this is one of the principal constituents. Without a proper supply of humus one cannot expect good crops. Humus is the home of soil

bacteria that are essential in building up plant food. Many fields are depleted of humus and many light yields are due partly to the fact that the humus is worked out of the soil by indifferent and careless handling of the soil. Humus is indispensable; it is the organic or vegetable matter, and we are somewhat responsible for the amount available. The depletion of the organic matter leads to impoverishment of the soil, and when this takes place it must be restored if we expect to obtain satisfactory returns.

Factors Causing Loss of Humus

One of the chief losses of humus is by the run-off of heavy rains and melting snow in the spring. The object in view when preparing a summer fallow is to conserve moisture and keep weeds in check. The chief object is to conserve moisture by plowing early in the rainy season to catch and hold all the rains that fall in the summertime, but no thought is given to conserve the snow that falls during the wintertime. This is allowed to run off the fields in the spring and little or no attempt is made to check this waste and hold it in the soil. Except on specially favored fields that lie completely flat, considerable of the snow water runs to waste. It runs off to the lower levels, into the sloughs, ravines, the pot holes in the field or roadside. This occurs especially on the summer fallow, prepared fall plowing, and to some extent on the stubble fields. Apart from the loss of the valuable snow water, it carries away with it the finer particles of soil, principally the humus, from the higher to the lower levels, or from off the field altogether into the waste places. These very fine particles are the richest and most valuable part of the soil,

and every time they are carried away the field is depleted of plant food.

What appears to be fine soil grains is really organic matter or humus, and the choicest part of the soil that is necesary to feed the crop. Examine the soil when it is dry under a microscope, and it will be noted that it contains a large amount of organic matter—decayed vegetation. It is more easily carried away by the melt-

Fig. 26.—A Field of Oats Yielding 130 Bushels per Acre.

ing snow than are the soil grains proper. This waste goes on from season to season. The conservation of the rainfall throughout the summer is considered and emphasized, while much of the waste is allowed to go on for want of some attention. In many instances the summer fallow is done too late in the season, and opportunity to catch the rains is lost. Only a single plowing is given, and at that time the moisture has evaporated

from the stubble field and it is difficult to plow. It is done when the soil is out of condition to plow; when a shallow cultivation ought to have been given, either in the fall or early spring, by the use of a good cultivator, disc harrow or shallow plowing. This would create a mulch to check evaporation and keep the soil in condition to plow and make plowing easier.

If a summer fallow is worth doing at all it is surely worth doing well. One can afford to go deeper in plowing a summer fallow to prepare a reservoir to hold all the moisture that falls. Care should be taken to prevent weeds getting up too high, as they pump out moisture at a great rate, besides robbing the soil of the fertility. To do the best work weeds should not be allowed to get firmly established in the fields. The use of a good cultivator, if used in good time, will prevent this.

The Causes of Soil Drifting

Before I go on to describe a simple method whereby we may prevent the loss or waste of fertility, I shall refer to another waste of humus that is going on each season—namely, by drifting of the soil, chiefly in the spring before the crop is advanced sufficiently to check it. Under our western conditions where the prevailing high winds in the spring, especially during the month of May, not only evaporate considerable moisture but carry away soil into the atmosphere, into the lower parts of the field, into the wayside, the fences—where may be seen banks of drifted soil which enrich the weeds and grasses—not only the soil grains proper but also valuable humus is carried away. In many fields nearly all the top soil has blown away, leaving only the bare subsoil. While these losses occur in some districts

more than others, it is mainly due to a lack of fibre that is essential to bind the soil grains together. Burning the stubble is responible for much of the loss, and while I am not going to condemn this practiee altogether, it is well to point out the danger. For an immediate return from a financial point of view the soil is being put out of condition. Under our conditions where straight grain growing is the rule, where there are few or no crops of rotation, such as grasses or legumes, to return some of the organic matter, this depletion of the fibre is being intensified by burning off the stubble.

Another of the causes is continual shallow plowing in the spring for crop. It is a common practice to plow shallow in the spring and sow a crop on plowing three or four inches deep. There are many fields that have not been deepened since the first plowing. The condition of these fields may be termed porous, or puffy, loose, almost the consistency of ashes. Advise a farmer to use a packer and you will be confronted with the statement that packers are of no use in his district as the soil blows whether a packer is used or not; so the packer is condemned. The fault lies not with the packer, but with the soil. The humus or life is worked out of it; the binding matter—the heart, the life—is not there.

Prevention of Loss of Humus

I shall deal with summer fallow, prepared the previous season, and this treatment also applies to fall plowing that has been made ready by working down ready for seeding or to new breaking or any prepared fields that are to be seeded in the spring. The prevention of the waste of fertility and the conservation of snow water will depend on the condition of the field before the win

ter sets in; also to some extent on the configuration of the field. Usually a summer fallow is made compacted throughout the season by cultivation, and in some cases by the trampling of stock put on the field to keep down weed growth. With some the object is to firm the field and make it solid. While this is done with reason, it is a wrong practice to allow the field to go into the winter in this condition, as it often happens that in the spring when a thaw comes the snow melts at the surface of the ground and, freezing at night, the snow crystalizes. Later, when the weather becomes warmer and the snow melts further, it forms a coating of ice on the soil and allows some of the water to run off. When the snow melts rapidly the soil is so compacted that the water does not penetrate easily and considerably more runs off to the lower levels and off the field altogether, and, as I have already pointed out, carries away some of the humus.

The simple operation I had reference to that will prevent much of this waste, and on many fields, of all the waste, is as follows: Instead of leaving the summer fallow to go into the winter as the harrows or the trampling stock would leave it, it will be found that the very best condition to leave the field is in a corrugated condition. There is a reason. It is this corrugation of the field that prevents the waste of the snow water, and, when rightly understood and followed in practice, it will lead to a marked improvement of the soil.

We will now consider the effect of the corrugation. When it is done across the slope of the field or on the level, the ridges of the corrugations act as miniature dams and hold back the water until it percolates down into the soil. The amount of water that is held depends on the corrugations and ridges. Those made by the drag

harrows are insignificant, although better than the smooth surface. The disc harrow may be used, but it leaves the soil too loose and porous. The implement that does the best service is the spring-tooth cultivator, providing the teeth are about two inches in width. Using it over the field that has been well firmed previously will throw up ridges and open up furrows. The ridges hold back the water and the furrows receive it, to percolate down into —not the seed bed, but the root bed, the place where the plant takes up the food necessary for vigorous growth. This single operation doubles the storage of moisture in the field. What is held of the melted snow is added to that stored the previous summer. The best results are obtained by the use of a good cultivator, equipped with teeth adjusted to open the soil only to the depth of two to two and a half inches, not more than three inches. This is important. No more or less, if possible. If used any deeper it will interfere with the firm root bed.

Deep Plowing Provides Seed and Root Bed

When plowing the fallow, or whatever field is under consideration, the principal object to be considered is to provide a depth of not less than six inches, preferably eight inches. If the plowing is eight inches deep and well firmed it will allow of a six-inch-deep root bed and a two-inch seed bed. It would be well to bear this in mind. The bottom portion, constituting the root bed, should be firm, while the upper portion, called the seed bed, should be loose.

This will be understood better as I go on further, and it would be well at this stage to take up the matter of the seed and root bed. It is obvious on every hand each

spring at seeding time that this is not rightly understood by many farmers, by the manner in which so many fields are plowed and seeded. When a three to four-inch plowing is done, and the seed got into the soil as quickly as possible, there is no such thing as a seed and root bed provided. It is either all seed bed or all root bed, just as one

Fig. 27.—Red Clover for Seed, 1916.

may wish to call it. What may be rightly called the seed bed is where the seed is to be deposited deep enough to find the moisture and to germinate near enough to the heat and light and air for quick germination and healthy development of the root system. The growth of the plant depends on the root bed, and this must be provided if we want a healthy plant. If every grower realized fully the actual need of a sufficiently deep root bed there would be fewer crop failures.

Corrugate Land in the Fall

A reasonably deep plowing, thoroughly firmed by the soil packer, cultivated throughout the season, corrugated at the end of the season, and left in that condition to go into the winter—this would constitute the very best seed and root bed. If it is handled rightly, and the principle is thoroughly understood, it will not fail to grow a satisfactory crop, even with a limited rainfall. It is not so much the want of rain throughout the growing season that causes many crop failures as the want of a properly fitted soil for the crop to grow in. I have made no reference to weeds, although they are a factor in determining the yields, and rob the soil of moisture and fertility. The working of the soil along the lines referred to will help much in keeping the weeds in check.

I will now point out the best time to do the corrugation, although it is not necessary to do it at any particular time, except that it must be done before the ground freezes up. If possible, it may be done immediately before harvest operations, or at any time between harvest and threshing. If it is done at this time, and any very heavy rains fall, the soil will be in fine condition to receive it. But there is one advantage of doing this work early in the fall. It has been demonstrated and proven that seven times more nitrates develop in the early fall cultivating or plowing than in the spring, or on stubble fields that are left unplowed. It is a well-known fact that the soil bacteria that build up plant food are more active in the fall, and the spring-tooth cultivator, used intelligently at this time, is an ideal implement. If the work cannot be done at this time it may be done at the end of the season. The ridges left by the cultivator allow one to

go on the land early, as soon as the snow has left the field, sooner than if the land is left smooth and compacted. When it is smooth and compact the air is excluded, and the soil needs opening up to the air and warmth of the atmosphere before the seed is sown. Usually the harrows are used to do this work, but in many cases the soil is so firm that they merely scratch it; so that it needs more than one operation to stir it up sufficiently.

What is wanted is the top two to two and a half inches loose, mellow and friable and moist when the seed is planted. We have this condition when the corrugation is made, as the ridges are acted upon by the influence of the frost at night, the sun and the air by day, and by reason of their looseness and friability the soil is easy to pull down with the harrows. This should be done across the ridges. All that is necessary is to level them down, and a single stroke of the harrows will do this work.

We have now the lower depths filled with moisture, the upper two or three inches loose and friable. This allows easy penetration of the seeder without any extra pressure to place the seed at the proper depth. It is now in an ideal condition to plant the seed if it is a grain crop that is to be sown; the seed will not go deeper than necessary, about one to one and a half inches. After the packer goes over it to bring the moisture into direct contact with the seed, to hasten germination, the seed will be down about one and a half inches deep. This is the best depth for most conditions. This loose top-soil answers the purpose of the mulch to prevent evaporation. The seed is at the depth where the air and warmth can reach it. It is not necessary to harrow after the packer, especially where the soil is inclined to drift.

By the simple operation described, practically all, or most, of the snow water may be held in the soil, and the fine particles of humus will be deposited at the bottom of the corrugations by the water, and in just the right place where the seed, as soon as germination takes place and rooting begins, can use it to the best advantage. These conditions will encourage deep, vigorous and strong rooting of the plant, which is essential to healthy growth to carry the crop over any dry period that may occur.

With regard to the soil drifting, I am aware that some will claim that this will happen despite anything that may be done, but I feel confident that this operation will prevent much soil drifting. Harrows should be used as little as possible.

Now, this operation is not going to be of much service to anyone except where the soil was left in the condition I have advised. Where the summer fallow was left at the end of the season in a smooth, compacted condition it may be stirred at the depth I have mentioned before the land is seeded; but the spring-tooth cultivator may be used to good effect, providing it is used with some judgment and the soil is not stirred any deeper than two and a half inches. It should be harrowed crossways to level the field before it is seeded. This stirring of the soil will more than repay for the time spent in fitting it for the seed. The operation I have outlined is applicable to new breaking or prepared fall plowing, as well as the summer fallow.

I had reference to the corrugation of the soil as a simple operation, because it is so simple and still so effective that the full measure of its possibilities cannot be realized, except by actual demonstration. It is the simple things in life that are overlooked and under-

estimated, and opportunities thereby missed. It is what I call the dry farm irrigator's irrigation on dry farming principles, applicable to soils that are dependent on scant rainfall.

It will carry the plant over the dry period at a time, in the early part of June, when the plant will receive a check if it lacks moisture. I consider this time the most critical in the plant's growth.

There are several makes of the kind of cultivator that will do excellent work in corrugating or ridging the soil. Those that cover the most ground at one stroke and are light in draft are the most economical. Failing one of these kinds, an old hoe drill with cultivator points will do good work. It must be borne in mind that the levelling of the surface by the use of plank drags, thus firming the soil, must be done the previous season, and the corrugation done at any time before winter sets in, and left in that shape. Better work will be done by the cultivator after the soil has well settled and firmed by previous tillage operations, and judgment must be used to do this corrugation across the slope, as the object is to prevent the water running off. If it is done down the slope it will have the reverse effect. Where the fields are rolling in character it must be left to the judgment of the individual how to have the ridging done.

Shallow vs. Deep Plowing

Soil drifting is largely due to depletion of the organic matter. The season of 1914 was unusually dry in my district (Rosthern, Saskatchewan), when only about three inches of rain fell during the growing season. I harvested from spring-plowed stubble lands a field of oats of 80 bushels per acre, as well as a fine crop of

wheat, and the heaviest crop of potatoes I ever grew, many individual hills weighing ten and a half pounds each, and tubers ranging from two to three and a half pounds or more each.

In the season of 1915, another dry summer, with only three inches of rainfall, on spring-plowed stubble fields barley yielded 50 bushels per acre; oats on two different fields, 80 bushels per acre, besides other good crops of wheat, potatoes, etc.

I am not making reference here to the above for the purpose of drawing attention to my yields, but to point out the fact that they were grown in two successive seasons of scant rainfall. The stubble fields were plowed—not three inches deep, but what I consider deep plowing for a stubble-plowed crop—seven to eight inches deep. The general practice is to plow shallow in the spring before seeding to a crop of grain, except under special conditions.

I have advocated deep plowing in the spring, and I am not basing my judgment on the two seasons I had reference to. In some seasons one may plow very shallow and still harvest a satisfactory crop; but it was not because it was plowed shallow. In plowing three to four inches one can hardly expect to provide a seed bed and a root bed. It is either all seed bed or all root bed. By plowing seven to eight inches deep one may have the top two to three inches for the seed bed and the lower four or five inches or six inches for the root bed.

Where so many fall down on this point is for want of a definite understanding as to the requirements of the seed and plant. Many good, well-meaning authorities advocate deep plowing, and others shallow plowing. Many follow the advice to plow deeply, and it is two

chances to one that they go to the extreme and plow too deep and do not realize the results anticipated, and so condemn it. On the other hand, many follow the shallow plowing method, and while in some seasons they hit it right, in many cases it is the cause of light yields or

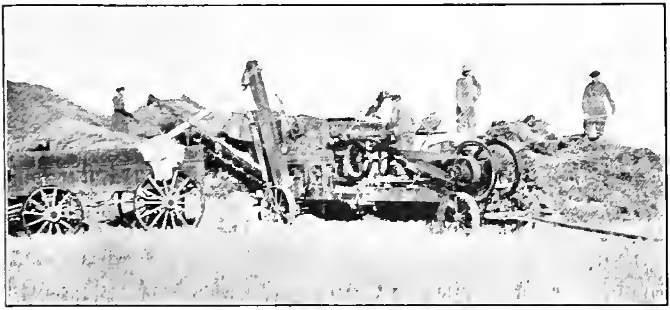


Fig. 28.—Threshing with a Small Outfit.

total failure; so between the two systems there is some contention, and many, being undecided which is best, usually end up by plowing any old way at all.

In shallow plowing—I mean from three to four inches deep—there is insufficient depth of soil under our conditions. Evaporation takes place at this time more than later in the season. There is not time for the soil to settle, as seeding must be done quickly, and where a furrow of three to four inches deep is turned under with a crop of coarse stubble it generally results in a breaking up of the continuity with the lower soil. Being loose, and more especially where the harrows are used to settle the soil and no packer used at all, the moisture in the furrow slice is soon evaporated or used up by the growing crops. On the other hand, the deeper plowing of at

least six to eight inches can be made firmer, and this is a greater store of moisture, as the weight of the turned furrow will help it to solidify, especially if the packer is used before and after seeding.

Plow Deeper Gradually

It should be thoroughly understood that whenever the deepening of the soil is done it should be done gradually, and at no time should there be more than two inches of new soil brought to the surface.

The bringing up of new soil is beneficial for several reasons. There are many who have the general idea that if two inches of raw soil were brought to the surface in spring plowing and seeded to a grain crop, it would be a failure and that the crop would not materialize. I want to dispel this idea, as it must not be overlooked that the seed is not planted in the raw soil, but below it. The raw soil is left on the surface, and I know of no better material to constitute a mulch to prevent evaporation or soil drifting. Soil will not blow or drift that has one inch or two inches of raw soil on the surface. The winds have little effect on it, and it is not interfering with the crop growth. Lying at the surface, this raw soil is rich in plant food, but it is locked up; it is insoluble, it cannot feed the plant, and it is not intended to at this time.

It is exposed to the influence of the elements that will pulverize and break it down, and unlock some of the plant food, and it is in the right place for this to be done. Lying at the bottom of a furrow that has been continually turned, it is not so available; but when it is brought up to the beneficial action of the elements it can be brought into service. We are told that our soils

are rich in nitrogen, or plant food, down to the first, second and third foot of soil; but it is not of much use to us unless we can use it. If we plow continually three to four inches we are not making the most of our opportunities. Every raindrop, every wind that blows, every stirring it receives, every snowflake, will exert an influence in unlocking some of the plant food as it lies on the surface. It deepens our soil. When brought deeper, the root bed is useful as a mulch at a time when it is most needed, and it is not interfering with the growing crops. When the soil is again plowed it is turned back to the bottom of the furrow, a fresh deposit for future needs. It is put where it cannot be lost or wasted, and it has added just a little more fertility to the soil.

Value of the Packer Attachment

I have pointed out the beneficent effect of the deepening of the soil and the providing of a sound root and seed bed on stubble lands in the spring. The small packer attachment to the plow plays an important part. I cannot emphasize too strongly on this point, as it is something almost indispensable, while it is not absolutely necessary. The beneficent effect on the soil, the direct effect in conserving the moisture, the indirect effect in keeping the soil in condition to prevent the waste of fertility, makes it one of the most profitable implements necessary to tillage.

I am now writing as a farmer to farmers. I have no axe to grind. I am advocating, and have advocated in the past, the use of the small packer attachment to the plow. Years ago I used a home-made roller behind the plow, and when the small packer was introduced I was one of the first to use it. I have used it consistently on

all occasions in plowing, except in special cases that called for special treatment where the object was to eradicate patches of couch grass or where the prairie rose had taken hold on the soil. In these cases when summer fallowing it is well not to use the packer, as the object is to leave the soil loose to dry, especially in the hot weather, when in a few days the roots will dry quickly and die. In using this small packer one should do so with the understanding that the object is not to firm or pack the furrow slice, as the larger packer should be used for this purpose; but for the purpose of firming the top soil, to prevent evaporation, and to pave the way for the larger packer to follow. Save the moisture and you save the fertility.

With regard to spring plowing, having turned down the deep furrow, bringing up the new soil, the packer attachment presses down, and, to same extent, pulverizes the lumps. This granular mulch checks evaporation immediately the soil is turned. Bear in mind that this is done at one operation. It saves time in harrowing. Instead of the soil being at the mercy of the winds and sun, if left rough, the moisture is conserved at once. It should be understood that when the soil is loosened or stirred at any time some moisture is lost. When the object is to create a mulch on the surface of the soil it is loosened and stirred. This stirring by the harrows to create the mulch, especially after heavy rains, is done to loosen and dry out the soil to the depth of the required mulch. If we turn the soil up with the plow and we leave it until it is harrowed down again, some moisture is lost. Even in harrowing the plowed land more moisture is lost. When the small packer follows the plow practically all the moisture is conserved. This may be fol-

lowed by the larger packer to firm down the furrow slice, followed by the plank drag to level the field and uniform the surface. It is ready then for the seeder.

The packer again follows the seeder to bring the moisture into direct contact with the seed. Where the soil is inclined to drift the harrowing may be dispensed with. It will be noted that no harrowing is done. Under our conditions we want a deep root and seed bed, and all the moisture possible, and the seed planted as quickly as possible.

Harrow Grain for Weeds

When this is done it may be harrowed as considered necessary. Plowing done in this way may be harrowed as the point of the grain is showing above the ground. Fitted in this way, it may be safely harrowed later after the grain is well established, if necessary, to destroy weeds. What we have to avoid is a shallow, loose soil in the spring. We should leave nothing to chance.

I have written of deep plowing in the spring, and this is only of practical value when it brings up not more than two inches of new soil. One should not bring up more than this at one operation in plowing, whether in the spring, summer or fall. The object is to protect the humus to prevent it blowing away, and to deepen the plowing.

In conclusion, we must get away from the general idea that all we need to do is to blacken the fields in plowing, or to plow at any time of the season, early or late, or just when the opportunity to plow fits in with our work, regardless of whether the soil is in fit condition to plow or not; or by plowing at any depth to suit the requirements of the individual or the team. There is a time to

plow to cultivate the soil and opportunity for conserving and adding fertility to the soil, and it is largely in the hands of the individual. I have emphasized on two points—corrugating the land in the fall, and deeper plowing to prevent loss of humus by blowing away and to add some fertility. I would also add that when one burns the stubble he is burning up humus and nitrogen, and continual practice of this will soon leave the soil to the mercy of the winds.

CHAPTER IX

Fall Plowing

In Western Canada the spring opens up anywhere from the middle of March to early in May. The latest date I have known the soil to be ready for the seed was May 13th; the earliest date, March 15th. These are exceptional dates, however. In general, spring opens up about the middle of April, and May 15th is abont the latest date generally understood to be safe to seed wheat. Any wheat sown after that date has to run the risk of being affected by fall frost or rust.

Under these limitations, for safe seeding of wheat, considerable areas are plowed up in the fall for cropping to wheat the following spring. In some seasons often the plowing is carried on too late in the fall, sometimes to the end of the first week in November. The ground usually freezes up at the end of October and tillage operations cease, excepting in a few districts.

It is not wise to plow too late. As much plowing as possible may be done up to the middle of October. Any work that ean be done after that date should be confined to shallow plowing or cultivation on land intended to be summer-fallowed the following season. Ofter more profitable work may be done if the plowing ceases before that

time, and this fall cultivation is done as a preliminary to spring plowing for the wheat, oats or barley crop.

In plowing for a grain crop one should first plow the newest and cleanest land. Old lands, infested with weeds, should not be plowed, but first should be given a preliminary shallow plowing or cultivation previous to another and deeper plowing in the spring. This applies particularly where the Wild Oat is in evidence. Indiscriminate fall plowing of any lands, regardless of the condition, should be avoided; there should be a definite object in view.

On my own farm, cropped for over twenty years, I have not had a crop failure, despite the certain drawbacks of varying seasons. This preliminary fall cultivation by shallow plowing is carried on when possible for spring-plowed crops, weeds thus being kept under control; also drought or a season of light rainfall is met successfully when otherwise the crop might fail.

Leave Land Ready for the Seed

Fall plowing intended for crop the following spring should be put into condition at the time of plowing, ready for the seed drill, and not left rough and open to hold the snow. There is not as much gained in the latter case as is generally believed. Rather is it otherwise. The object of adding moisture in the soil is defeated because between the thawing and freezing in the early spring most of this moisture is lost before it can be harrowed down, even in seasons of deep snowfall; much more so when the snowfall is light. If little or no snow has fallen, what moisture may be in the furrow slice is evaporated during the winter. When pulled down by the harrow in the spring, the soil is often dry and porous.

Often poor and uneven germination of the seed is due to this cause, and if no rains fall early in the season the dry and evaporating winds that are so prevalent will rob the plant of necessary moisture. Sometimes in the fall when rain comes at the time of plowing or after the field is plowed it is lost, as it would require almost a cloudburst to penetrate the rough, dry, open spaces in the soil; also what rains do penetrate go into the soil at the bottom of the furrow, but only where there are large

Fig. 29.—Field of Victory Oats in Stook.

open spaces between the furrows. What enters the surface portion may be evaporated again before the first snowfall comes.

It is more difficult to firm the soil in the spring previous to seeding, as conditions are not as favorable as in the fall, and it is not often possible to prepare an ideal root and seed bed. Weeds get a start of the grain crop and an opportunity to destroy them is often missed.

The advantage of preparing the root and seed bed in the fall is worth considering. When this is done at the time of plowing, the moisture in the soil is conserved.

Should rain fall it can enter the soil readily. Some weed seeds will germinate. Soil nitrates develop freely in the early fall. In the spring there is another opportunity to destroy weeds that germinate at that time before the crop is seeded. The melting snow in the spring enters the soil, and is not lost by evaporation, as is the case from the open plowing. There are many advantages from the working down of the fall plowing.

Depth to Plow in the Fall

The depth to plow in the fall may be regulated by the character of the soil. In general I would advise as deep plowing as is possible—to provide a root and seed bed—the lower portion of the plowing firmed and the upper two or three inches loose. The soil packer should follow the plow, the plank drag to follow the packer; the field then may be harrowed as necessary. In every case where the plank drag is used the land should be harrowed as soon as possible afterwards. If it is desired to catch and hold some snow the spring-tooth cultivator may be used at the last operation.

In the spring, as soon as the soil is dry enough, harrowing should be done. There is invariably some time to spare in the spring to do this work when the summer fallow is still too wet and cold to seed.

Where many make a mistake is in seeding fall plowing too early. If seeded first thing, or too early, weeds often get a firm foothold before the crop is well above the ground. There is no necessity for seeding it too early. Fall-plowed soils will mature a crop sooner than on summer fallow or spring plowing, and may be seeded after the summer fallow is finished and, in many cases, after the spring plowing is sown. By letting the fall

plowing that is harrowed in the early spring stand, many weed seeds will germinate, so that they can be destroyed just previous to seeding, and in many cases it may be left until the last and still the wheat crop will mature sometimes sooner than will the summer fallow or spring-plowed crop.

Where a crop of oats or barley is to be grown, there are still greater possibilities to control weeds. Where wild oats is the most troublesome weed, and the field is allowed to stand until most of them show up, the field may be again skim-plowed, or the duckfoot cultivator may be run over the field previous to seeding to barley or a crop of green feed. In some seasons an oat crop may thus be grown and many of the wild oats eliminated.

CHAPTER X

Spring Plowing

Owing to the limited time in the fall large areas of stubble land are plowed in the spring, either previously cultivated or uncultivated, to be seeded to a grain crop. If the question were put up to the majority of grain growers of Western Canada as to which gives the best results, either spring or fall plowing, it would be safe to say they would decide in favor of the spring plowing.

There is no doubt in my mind that spring plowing of late years does give more satisfactory returns than are obtained from fall plowing. But on the whole it is an open question whether this is strictly correct owing to so many acres being plowed in the fall indiscriminately, with no well-defined purpose or plan; providing only that the land is made black by the plow as rapidly as possible. Often this results in unsatisfactory crops—patchy, weedy, and light crops, aggravated by drouthy conditions—and often there is a lack of necessary moisture to germinate the seed uniformly; whereas, when the land is plowed in the spring and the seed is put into the soil without any loss of moisture from the soil, a better showing is made. At the same time, equally good and sometimes better results are gained by properly fitted

plowing in the fall, ready for the seeder; but, as I have pointed out in the chapter on Fall Plowing, only comparatively new lands fairly free from weed seeds ought to be plowed up. When it is intended to do this work in the spring the field should be given some surface cultivation by the plow, disc harrow or cultivator. (See Chapter XI—"Fall Cultivation of Stubble"—Page 147). The purpose of this is to start into life any weed seeds and to maintain a mulch. The plowing is made easier as the soil is in better condition to plow.

Spring plowing generally comes after the summer fallow, or after breaking, and must be done as quickly as convenient, time being the all-important factor in bringing the crop to maturity before fall frosts and rust can affect it. It is not wise to seed wheat after about the 15th of May, although in some seasons wheat seeding is extended after that time. Hon. W. R. Motherwell, Minister of Agriculture for Saskatchewan, puts it in a very pointed manner: "The man who sows wheat after the 15th of May gets all he deserves, and deserves all he gets!" This is the whole thing in a nutshell and it signifies this—the crop is liable to frost and rust. With the introduction of varieties of wheat that will mature safely about the first week in August—other than now prominently grown—the seeding of wheat may be extended accordingly.

Spring Plowing Generally too Shallow

In plowing in the spring, generally speaking, the custom is to plow too shallow. In the earlier stages of settlement of the Western prairies the general advice was to plow shallow, and this advice is still adhered to by many growers; but there is no definite reason for doing

so. This common practice is partly responsible for unsatisfactory crops, drifting soil and some loss of fertility. To make a continual practice of plowing shallow at this time in the spring is not sound. Thousands of acres are depleted of humus and fibre, the most valuable portion of the soil, which lies at the top in virgin prairie soils, and by continually plowing back and forth at the same shallow depth the soil is left to the mercy of the drifting winds that prevail more or less every spring. Burning off of the stubble also is responsible for some loss.

I am a strong advocate of deeper plowing at all times. By deep plowing I mean anywhere deeper than six inches. When the plowing is done at four inches it would be more profitable if done at six or eight inches deep.

It is a matter for wonder why some men show a lack of intelligence on this subject. One will say that if you plow deep in the spring you will bring up weeds from below; meaning not weed seeds that have been buried, but weed seeds from new soil that have never been disturbed. Many hold the opinion that weeds are in the soil anyway, but as a matter of fact all the weeds we have are introduced by outside agencies. Another man will say, if he sees one plowing deep: "What are you plowing so deep for? You won't grow any crop. You will kill your land." Such men are shallow plowers all the time.

Others will say that they cannot plow deep, as the team is not able to do so. This may be true. They use a 14-inch gang plow when a 12-inch gang would do more profitable work. Others plow shallow to get the work done as quickly as possible.

The Gospel of Good Farming is to do all things well, not to consider how quickly or how cheaply the crop can be seeded on as many acres as can be done in a given time; better to give consideration to the policy, not more acres, but better acres. One cannot force nature, but one can work hand-in-hand with her, and he who reads her aright çannot fail. It is a simple Gospel after all.

My advice is to plow deep in the spring for a crop of any kind—whether it is grain, potatoes, forage crops, roots or vegetables—unless there are special reasons for not doing so. Sometimes it is profitable to plow shallow on land after a summer fallow crop where the fallow was well done, clean and free from weeds and where the stubble was cut low. In this case the one crop only was taken off a good fallow, and by plowing shallow it really is making a seed bed with a firm soil below; in this case, the fallow must have been plowed deep enough previously.

One of the reasons why a spring-plowed crop sometimes turns yellow and suffers in a dry spell is that long, coarse stubble is turned under in a shallow furrow. The coarse stubble lying between the inverted furrow and the soil below breaks up the capillarity. In this case evaporation takes place in the furrow slice and the supply from the lower portion is cut off, requiring abundant rainfall to nourish the crop.

When the plowing is anywhere from six to eight inches deep the weight of the furrow slice, after cultivation until the crop is seeded, brings about a continuity with the soil below, and thereby movement of water from the lower depth within the reach of the growing crop. At this depth of plowing it is possible to make both a root and seed bed, whereas if plowed shallow three to four

inches only, no provision is made for the root bed, it being all seed bed only.

It is not my intention to condemn those who thus plow shallow continually every spring so much as it is to condemn the theory or the method. There was a time when I also plowed shallow in the spring, because I accepted the general advice and custom to do so; but experience is sometimes an expensive teacher. I learned, and sometimes paid dearly for the teaching.

I want the reader of these pages to understand that this is not written with the object of preaching Better Farming in a dogmatic way, or to induce anyone to adopt any cast-iron theory. Rather would I point out the possibilities of deeper plowing in the spring along the line of the theory that in order to grow a crop we must have some depth to our plowing. It is not all theory, but has been tried and proven in actual practice.

Preparation for a Grain Crop on Spring Plowing

Plow deep with a packer attachment to the plow. I find the small surface packer very satisfactory. This will conserve the moisture in the soil as soon as it is turned by the plow. In the spring we have drying conditions—due to high, constant, evaporating winds—and we must conserve all the moisture possible to get the crop started. We often hear complaints of the seed lying in the soil, waiting for rains to germinate it wholly or partly. Often this could have been avoided. The packer attachment can be easily attached to the plow, and there is practically no side draught or noticeable effect on the team. After the land is plowed it should be packed by the large packer, as the object in using the attachment

to the plow is not to pack the plowing so much as it is to conserve the moisture at the same time as plowing, and it should not take the place of the heavier soil packer.

The kind of packer to use is really immaterial; both the sub-surface or surface packer will answer. Usually only one is used, and, personally, I would prefer the surface packer on the average soil. The packing presses the furrow slice down firmly.

The plank drag is used next to uniform the surface. Sometimes when it is dry the soil will move along the front edge of the drag, and it may seem that it is drying out the soil, but this is not so; the drag only operates on the surface, moving the rough edge left by the surface packer, and if the operation is done at the end of the day, it will be found in the morning just previous to seeding that the moisture has come to the top, just where it is needed in the seed bed for the seed to use it to germinate.

The seeder works nicely when this is done and the seed put down about two inches deep at a more uniform depth than when the field is only harrowed after the plow. If possible, the surface packer should follow behind the seeder or as soon as possible. The packer is not used to pack the soil, but to press the moist, warm soil firmly around the seed to start germination. Seed thus packed will come through the ground at least three days sooner than if not packed or only harrowed after seeding. While it is not essential to harrow after the packing, this may be done if time permits.

It will be noted that there are three operations previous to seeding and one after seeding. No harrows are used until after the seed is in the ground. The order

of the operation is: Plowing with packer attachment; packing; plank dragging; seeding and packing.

The general practice of plowing, followed by the harrows, when at least two harrowings are necessary, and then seeding, is often responsible for a lack of moisture, not in the root bed in the soil below, but in the seed bed, where it is wanted for the seed. It should always be

Fig. 30.—Cutting Alfalfa in Northern Saskatchewan.

borne in mind that all soil stirred by the passage of any implement through it hastens the evaporation of moisture. That is why we harrow or cultivate the top portion of the soil to prevent any evaporation from the soil below, and so create a mulch by keeping the top two or three inches dry and loose, as is the case on the summer fallow, fall plowing or other land where it is not intended to seed a crop immediately. In spring plowing we want the moisture as near the surface as is possible; the lower portion can take care of itself. By stirring the soil too frequently by the harrows we often defeat this object.

Cultivation after Seeding

After the field is seeded it may be harrowed or not, but it should be harrowed at the time the grain is showing through the soil. This will destroy any small weeds that may be germinated by this time and will encourage crop growth, at the same time maintaining a mulch. When this is done it gives the crop a chance to get firmly established before the weeds can get a footing.

Grain should not be left to get into the single leaf before this is done. If weeds start again after the crop is up, and it is desired to harrow the growing crop, it should not be done until the grain is beginning to stool well; for if done when in the single leaf some damage occurs through smothering the leaf and checking the growth of the grain.

Where couch grass, or sweet grass is established in a field that is to be spring-plowed for a grain crop, the weed roots are only anywhere from two to five inches below the surface; usually they are only about three inches below. In any case the plow should go about two inches deeper, or even four inches, providing there are two or more inches of soil covering the roots where they are turned up. The plowing is worked down by the packer and plank drag, and the grain is seeded above the roots, which are not disturbed, as would be the case if harrowed or disked.

Wheat, and especially barley and oats, may be grown in this way without the grasses interfering with the crop. The grain gets well established before the grasses can. A barley crop seeded in this way—being sure that about three inches of soil is above the roots—in many cases will practically destroy the grass by crowding it out.

This method of seeding all spring-plowed lands, by not using the harrow or any other stirring implement on the plowing until after the crop is seeded, is recommended. Once this is practised, one may not go back to the usual custom of harrowing after the plow or any time before the crop is seeded. The advice to harrow and to harrow and to harrow once more for luck does not hold good on the spring plowing for a grain crop under our conditions in the West. This advice applies only profitably where no grain crop or grasses or forage crops are to be grown. This theory of harrowing is often responsible for crop failure through lack of germination of the seed and weedy crops. When it is intended to sow small-seeded crops—such as alfalfa, clover and grasses—this method is the best I know of, more particularly when seeded after the plank dragging.

Too often, poor crops are traced to seeding on the loose plowing, no packer being used, but simply plowing and harrowing after the seed. On the summer fallow, fall plowing, or other lands not to be seeded at once, one may harrow often, the moisture then being held in the soil below, as is very essential. The seed may be put down about two inches on spring plowing when done in the way outlined; for when the soil settles it is really only about one and a half inches or less. An ideal depth to seed on fallow or fall-plowed land is one inch or one and a half inches, to prevent any double rooting. (See Chapter II—Seeding Operations—Page 49). In any case, it is understood that the seed is put down into the moisture.

Oats and barley may be seeded slightly deeper than wheat.

CHAPTER XI

Fall Cultivation of Stubble Land

The cultivation of stubble in the fall is so essential that a separate chapter may be devoted to the subject, although some of the ground is covered in the chapter on Tillage Operations.

The practice of cultivating the stubble with the disc harrow following the binder is urged in publications on soil tillage, particularly dry farming, and in the agricultural press. This is good advice and, wherever practicable, it should be followed. The main difficulty lies in the lack of means to do so. Farm help is scarce and, generally speaking, the grain grower needs all the help be can afford or get to harvest the crop as quickly as possible. The teams are needed to cut the crop. In some instances, where help is available on the farm and teams can be spared to do this work, it may be preferred. The individual must decide if this work can be done. There is not the slightset doubt that it is profitable work, if it can be managed.

Failing to do the work at this time, it should be gone ahead with after the crop is removed. In planning it, some consideration should be given to the condition of the field. Weed-infested fields should receive first consideration to encourage some germination of the weed

seeds that fall on land that is to be plowed again the following spring for a grain crop.

Cultivation of the stubble should be done to form a mulch and control the weeds. Where there are wild oats and native grasses use shallow plowing about two to two and a half inches deep, packed down by the surface packer, and, if time permits, followed by the drag harrow. Where drought, not weeds, is to be considered, then the disc harrow or cultivator may be used.

The choice of implements for cultivation may be regulated by the work to be done, whether control of weeds, offsetting the effects of drought, or both. The double disc harrow, with both in-throw and out-throw, is the most economical disc to use, as it covers a large area at one operation in a short period. When the single disc harrow is used it is necessary to give a double stroke by lapping half way each round of the field. There are many styles of disc harrow, and the best to use is one that does the work uniformly over the field and does not ridge the soil.

When a spring-tooth cultivator is used, the teeth should be spaced wide enough apart to prevent any gathering of the loosened stubble. Should stubble bunch up in the teeth they cannot penetrate the soil. The teeth should be staggered to prevent this and allow the stubble to pass by freely.

On small farms and where it is possible to cover the ground quickly, the gang plow is the most satisfactory in all cases. The kind of plow to use for this work, and one that also does satisfactory work in deeper plowing on average soil, is a plow with a low down and medium long sloping mouldboard, so that the furrow can turn over easily without breaking the furrow slice. A short,

abrupt mouldboard is not so suitable for this purpose as the furrow slice will break and not turn over completely flat.

Plow Shallow to Start the Weeds

The plowing should be done as shallow as possible to bring the weed seeds where they will germinate freely. If turned under too deep, little or no germination takes place that fall. As weed control is one of the objects of doing this work, it is desirable to encourage as many weed seeds to germinate as possible. This shallow plowing also makes an excellent mulch to prevent any loss of moisture at this time. While apparently the plow will not cover as large an area as the disc harrow or cultivator, there is much in its favor in the more complete and thorough work that can be done, requiring, as it does, only the surface packer to finish the operation.

In disking one must disc double and harrow afterwards to make a satisfactory job. Often the loosened stubble gathers and bunches up under the harrow, and this must be removed continually. When it is intended to disc the fields the stubble should be cut low down for this reason.

While it is sometimes advisable to burn off long, coarse stubble to allow free passage for the cultivator or harrows, it is not sound practice, and is responsible in many cases for drifting of soil and loss of fibre and humus. It is sound practice to turn under all the stubble possible, to provide fibre and humus.

Cultivation in the fall to conserve moisture and bring up weed seeds, and as preliminary work for the deeper plowing the following spring, makes the plowing easier. Where stubble fields are left uncultivated they will often

dry out when the time comes to plow the summer fallow, and often it is not possible to do so until a heavy rain comes. Weeds that may start into life in the spring, and volunteer grain, pump out considerable moisture before the field can be plowed. When the soil gets dry like this it is not in fit condition to plow. When the field is previously cultivated, especially when shallow plowed in the fall, the next plowing is easier and the inverted top portion makes a far better connection with the soil below. It lies soil to soil instead of with coarse stubble between the inverted furrow and the soil below.

There is much to be said in favor of the plow in fall cultivation of the stubble. The only disadvantage is that less work can be done than with the disc harrow and spring-tooth cultivator. When any work is left undone in the fall it may be finished early in the spring. Often opportunity is afforded to do this work while waiting for favorable weather to seed the crop in early spring.

CHAPTER XII

Grain Rust and Smut

Grain rust and smut are two factors to be reckoned with, and they play an important part in affecting the crop yield and the quality. Very serious losses in some seasons can be traced to these two plant diseases. Smut in grain may be controlled by taking precautionary measures in treating the seed before it is put in the ground. Grain rust is not so easily controlled, but may be partially met by seeding in good time and doing everything possible to encourage rapid growth of the crop to bring it to maturity in reasonably good time; also by the sowing of early varieties.

While rust is more or less in evidence every season, we can point to two seasons when it seriously affected the crop—1904 and 1916. It will be remembered that in 1904 the wheat crop was very slow in coming to maturity. It was left standing after the time when it is usual to cut the crop. Instead of ripening off a natural color it was apparently, to use a general comment made at the time, "getting greener instead of riper." The season being advanced, it was a case of cutting the crop green or running big chances of having it frozen. There was little gained by letting the crop stand so long, and in

some cases it was worthless, the grain being light in weight when threshed. I have found by experience that there is a time to cut the wheat crop, particularly when rust spreads through it. (See Chapter XIII—Harvesting—Page 160).

It is not my intention to go into details, describing the different kinds of rust and their life history. Briefly, rust is a parasite disease that attacks the stems of wheat, oats, barley, rye and the hay grasses—foxtail, western rye grass, Brome grass, couch grass. It spreads very rapidly through the crop when conditions are favorable.

In the year 1916 the loss from black rust throughout the spring wheat States of the United States was estimated at two hundred million bushels. In Canada the loss in dollars amounted to $102,250,000.

There are two kinds of rust that are known to affect the wheat, barley and rye crop, and two kinds that affect the oat crop. Those that attack the wheat, barley and rye are known as the "Orange Leaf" rust, and the "Black Stem" rust. The Orange rust occasionally attacks wheat, barley and rye and several of the hay grasses. It is the most widely distributed of grain rusts and the earliest to appear on wheat. Black rust is the most destructive grain rust in America. When it appears in the crop just after the blossoming stage it prevents complete filling of the grain. If conditions are favorable it spreads very rapidly, and sometimes the crop is worthless as far as the grain is concerned. The conditions so favorable for the spread of this disease are warm, close, murky or muggy weather, accompanied by heavy dews and fog, which often comes at night and hangs over the crop, particularly the lower portions of the field, until dispelled by the morning sun; also showery, warm weather at this

time, when the grain is commencing to fill, and the absence of winds does not permit free circulation of the air which would be very helpful to dry the grain, particularly in heavy, rank crops.

The time that black rust begins to develop in the crops is the first few days of August and, if the crop be well advanced at that time, it may complete filling; crops that are only commencing to fill may never complete filling and, if the rust spreads rapidly, may be worthless.

Black Stem Rust

The early stage of black stem can be recognized by spots of a rusty orange color; the red spores spread the disease from one wheat plant to the other throughout the fields during the whole summer. The black spores are produced for the purpose of carrying the disease over the winter; they cannot germinate until they have passed through a period of rest, and even then they are incapable of affecting the wheat directly. This dormant period lasts throughout the winter, and the spring. Upon germinating they infest the secondary host (*e.g.*, Barberry) and the spores resulting from this infection attack the wheat once more. Action is being taken throughout the West to destoy the Barberry shrub, as it is known to be a host plant for the black rust.

In 1903, in Denmark, where the black rust outbreak was growing more and more virulent each season, steps were taken to destroy every Barberry shrub, and this led to the gradual disappearance of the black rust so that it is practically unknown there to-day. In Western Canada steps are taken to destroy every known Barberry shrub, and it is to be hoped that this will go a

long way toward meeting the rust problem. Whether it will prove effective time will show.

This rust may be found in the dormant stage on old straw or stubble in the fall and winter. In the spring the spores begin to show life. Each spore germinates and produces small spores or seeds that can be carried long distances by the wind, but these cannot attack grains or grasses.

While the destruction of all the Barberry shrubs may meet the solution, it will be some time before any appreciable effect may take place. In the meantime, the grain grower can do much to offset any damage by the sowing of early varieties of wheat that can be expected to mature early in August. Any grain that is in the soft dough stage early in August has a chance to mature before rust can affect it, although the leaves and stems may be affected.

Stinking Smut of Wheat

Stinking smut of wheat, commonly known as ball smut, is a disease that until within the last few years has been responsible for serious losses each season to the grain grower. Owing to the vigorous campaign carried on throughout the West, urging every grower to take proper precautions to combat this disease, there has been a great reduction of the yearly losses from smut; so that only in isolated cases is smut now found in the wheat crops. In acting as a grain judge at various seed fairs I have found little or no traces of smut in the samples in the last year or two; whereas, formerly, it was found very frequently. This is a good sign, and it is to be hoped that the grain grower will not relax his efforts to keep smut under control. There is some danger that knowing

there is no evidence of smut in the crop, treatment of seed may be omitted in some season as unnecessary; but in no case should the treatment be omitted, as there are several ways by which the seed may become infected.

I would illustrate here a case in point. In growing some of my new wheats last season (1917)in single-head rows I found traces of ball smut. Now, these wheats were grown from single heads that showed no trace of smut, because they were hand-picked in the plots and the grains separated by hand and placed in envelopes to keep each head separate. As it is not easy to treat these few grains, they were sown each season without treatment, and in the course of a few years became infected in some way. No crops had been grown on the ground that had showed traces of smut for some years. While it is not easy to treat these small lots of grain for smut, the resulting crops can be easily treated when sown the following season.

In all probability the good results shown in the last few years may be traced to the fact that formalin is more widely used than bluestone. Certainly when bluestone was formerly used there was considerably more rust in the crops.

The smut ball that we know so well consists of very minute particles, known as "spores". These spores are the seed of the smut plant. When conditions are favorable it will grow in the soil and infect the grain plant very early while the plant is young. Soon after germination takes place the plant grows up and the smut is not noticeable until the grain is headed out and the heads are filled. By experience one may detect the heads that are smutted. Usually the infected heads are low down, mostly on the side stools. By spreading the

grain to one side, the infected heads may be detected by a bluish color instead of the natural green color of the heads.

It has been estimated that each smut ball carries approximately three to four million spores, or seeds. Every stem of a single plant may carry heads that are wholly filled with smut balls, or perhaps grain and some smut balls. There is a distinct loss of crop when the smut balls take the place of grains in the head, and also when the crop is threshed on a damp day the whole crop more or less may be tagged by smut. There are two distinct losses—loss of grain, decreasing the possible yield, and loss of grade, which is sometimes heavy through the tagging of the sample. If the seed from the crop is not properly treated, this will result in losses again the following season.

It is next to impossible to remove all the smut balls from the grain when cleaned for seed. Where infected grain is placed in sacks in the cleaning process the sacks also become infected, and if the seed when treated is again placed in the sacks it becomes infected again. In every case the sacks should be treated, as well as the seed.

Treatment for Smut

Treatment for smut is so simple and effective when properly done that no seed should go into the ground without it. The two agencies used to destroy the smut spores are bluestone and formalin. The formalin is more effective than the bluestone. There are still some farmers using bluestone, and wherever there were traces of smut in the fields sown with treated seed I have found on enquiring that bluestone has been used. Whether

this was the fault of the bluestone or not would be hard to determine. It is claimed on good authority that formalin is helpful and leads to increase in yield, whereas the bluestone, being a drying agent, is sometimes responsible for the drying up of the germ on the grain;

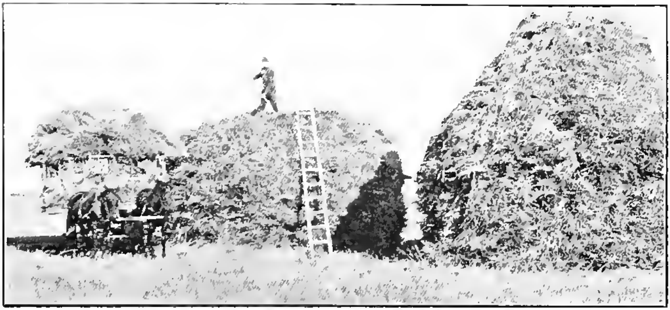


Fig. 31.—Stacking on a Prairie Farm.

it retards germination, while formalin often hastens it. Often when poor germination of the seed takes place the fault lies with formalin or bluestone on account of using too strong a solution.

There is no necessity for doing so. It is a common impression that a certain quantity of formalin or bluestone solution will treat a certain number of bushels of grain. One should not depend on this, but should be careful to have the solution at the proper strength. In some cases it is made too weak to be effective. It is most important that the solution be of the reqired strength, independent of the number of bushels of grain to be treated.

Where formalin is used the solution should be 1 to 40 of water. In cases where the grain is very smutty it

should be 1 to 30 or 35, according to the amount of smut in the grain. The surest way is to measure the amount of formalin and the water, and not guess at the amount.

A small graduated glass is very useful for the purpose. If the solution is too weak it cannot be expected to be effective.

METHODS OF TREATMENT

There are several methods for treating the grain. The seed may be laid on a clean floor and sprinkled and thoroughly stirred and mixed until every grain is wetted. There are machines for sprinkling the grain. The best and surest method is by immersion. There are several excellent machines for this purpose. Some of these machines skim off the smut balls while in operation.

Where small quantities are to be treated, as in the case of pedigreed or selected seed, it is more advisable to place the grain in sacks, having them half-full, and immersing them for five minutes in the solution, which is placed in a barrel. They are then taken out and drained and then turned upside down, setting the sacks on the floor side by side. In this way there is no chance of contamination by other grains and the purity is maintained.

I may mention in passing that I treat all my seed grain this way. A tripod and block is set over the barrel and this makes easy work handling the sacks. After being covered with sacking for two hours, the sacks are thrown down and when the grain is dry it is ready for the seeder. I find this very effective, and have not found a single trace of ball smut for some years past.

The only smut I have found in wheat was in 1917, in one of my head row plots. In this case, where the heads

of grain are sown in single rows, it is not easy to treat the seed. This demonstrates how smut will reappear if the seed is not treated each season.

Whichever method is adopted the treated grain should be covered with sacking or other suitable material for two hours; it is then uncovered and stirred and dried. Where oats and barley are treated they should remain a few minutes in the solution. It is not merely the covering of the grain by the solution that kills the spores, but also the gases that form. After immersion these grains also should be kept covered for the two hours.

For loose smut in wheat the formalin treatment is not effective. Loose smut, however, is not so serious as the ball smut.

CHAPTER XIII

Harvesting

This chapter is intended as a guide to wheat growers —to point out to them the best stage at which to cut a field of wheat so that it will yield grain of the highest quality. I am backing it up by many years' experience in grain fields at the different periods of the plant's growth. Owing to the losses of the wheat crops, due to rust and frost, of the season of 1916, it may be of some benefit and offset in some measure similar losses in the future. It is hardly possible to put in writing absolute information as to the exact stage at which crops ought to be cut; but the following directions may serve as a guide, especially to those who couple it with some close study of the berry or grain as it is nearing the ripening period.

The season of 1916 in the Western Provinces will be remembered as most disappointing, with respect to yield and quality, as far as the wheat crop was concerned. Hail, rust and frost took heavy toll of a most promising crop—one we had a right to harvest. The season opened up unusually favorably in the spring and conditions were all that could be desired in respect to the moisture in the ground. Abundance of rain fell after the seed was sown. The germination was very uniform; the growing

crops were in a healthy condition, and up until the end of July gave indication of a heavy, uniform yield. From that time on a change took place. Rust appeared. In general, the fields that gave the greatest promise were the most disappointing at threshing time, while the fields that were given scant attention at seeding time in many cases gave better results from a point of yield and quality than the better prepared fields of summer fallow. Hail also exacted heavy toll; but as this is an agency over which we have no control, I shall deal only with the losses due to rust and frost. The greatest losses were due to rust.

Lessons from Our 1916 Experience

The reason for some of the poorer fields giving the best results may be traced to the fact that they were nearer maturity than the better fields when the rust began to develop. The heavier crops were retarded by their rank growth, and consequently the rust affected these crops previous to the full development of the grain.

One lesson that may be taken from the experience of 1916 is that the early varieties of wheat escaped the rust and frost, which caught the later varieties, and also that the early sown fields escaped with least injury because they were nearer maturity than the late sown crops. Red Fife has been largely replaced by Marquis and other earlier varieties. Conditions might have been serious had Red Fife been as largely grown as it was some years ago. But even Marquis does not mature early enough to entirely escape damage by rust and frost. Rust played serious havoc in the wheatfields of Saskatchewan, Manitoba, and, to a lesser degree, in Alberta. A considerable acreage was left uncut as absolutely worthless and it had

to be fired in the spring of 1917, previous to seeding. Many thousands of acres were also harvested that yielded grain of a very low quality and but for the high prices would have been harvested only at a loss.

In many sections the grain was of such poor quality as to be unfit for seeding purposes. The estimated percentage of loss in the field for Canada is 43 per cent. of the crop for 1916, and the loss in money is estimated as $102,250,000. Personally, I would consider the loss even greater. In Minnesota and the Dakotas the loss in the field is estimated at 72 per cent. of the crop. All this loss was due to rust.

Late Maturing Crops Most Affected

Rust is present in every country where rains and dews prevail. It is present in our Western Provinces every season, and may be found on the wild rose bushes and some of the grasses. There are some indications of it almost every season in the grain fields, although not generally serious enough to be noticed. Whenever conditions are favorable for it to develop, however, we can expect it more or less according to the season. Fortunately, under our conditions it does not appear to any extent in the crops until the last few days of July or early in August, and it depends largely on the condition of the crops at that time whether it will be serious or not. Varieties of wheat that are partly or wholly filled, though not fully matured, at that time may be expected to continue development and to be harvested without any serious injury.

The late sown crops and those growing on rich fallow, which were so badly affected by the rust and later by the frost, were retarded in the ripening process owing

to the heavy precipitation, and were affected by the rust at a stage when the berry was beginning to fill or was only slightly filled. Consequently the ripening process was checked by the rust to such an extent that many such fields were left standing uncut. In other fields the frost completed the damage started by the rust.

There are some conflicting opinions as to whether it is advisable to leave the crop standing or to cut it down when rust is working. Whether it is advisable to cut or not depends largely on the weather conditions, the stage of the berry and on the time of the season. It can best be determined by the grower, and it will call for some judgment on his part. He should make a personal examination of the berry to see whether it is at or past a certain stage. This point I shall indicate. By it the grower may be able to determine whether it is best to cut the crops or not. I feel confident that if this point had been more generally understood than appears to be the case, considerable of the loss that occurred might have been prevented. Another factor that must be considered is the probability of frost, as frost may come any time after the middle of August.

Cutting Sometimes Delayed too Long

After a number of years' experience in the grain fields and smaller experimental plots, conducting seed selection work and growing many different varieties and strains of wheat—work which calls for close inspection and investigation throughout the growing season—I am in a position to assert that a considerable acreage of the wheat crop of 1916 should have been cut sooner than it was, and that the grain was more fully matured than was generally known. Many fields that yielded a low-

grade wheat should have been harvested earlier. If they had they would have yielded at least two grades higher. This point will be confirmed by many of the readers of this chapter who, becoming anxious about the crop, started cutting. After making some rounds they were not satisfied that the crops were ready to cut and pulled the binder off the field. The balance of the field was left standing until some days later, but when the two lots were threshed it was found that the first lot to be cut gave grain of a better quality than that which was cut last. In some instances this was due to the rust continuing to damage the crop, and in other cases to frost that damaged the plants that were left standing. I am perfectly convinced that rust eats up the crop if it attacks it at a certain stage. This proceeds until, when the crop is cut and dried, it is found that there is no substance in the grain, only the shell or bran being left.

When the berry is only in the soft dough stage it may be found more advisable to cut it than to leave it standing and run chances of a frost or further dying by rust. A frosted or frozen crop may be disappointing; but it is of more value than a crop that is eaten up by rust, for the reason that the frost sometimes causes a loss only of grade and very little for the weight. Rusted grain loses both in weight and grade. Most serious of all is a rusted crop left standing until it is frozen. Frost and rust will injure it separately. Frozen wheat is of more value for seed purposes than badly shrunken, rusted seed. Therefore, if the grain is only in the soft dough stage it may be more advisable to cut it than to leave it standing. If cut at that stage there will be sufficient moisture or juice in the straw to continue the development of the berry while in the stook. This point has

largely been overlooked. Further on I hope to make it clear.

Conditions During August, 1916

As I pointed out, the crop up to the end of July was most promising. As we entered the first few days of August, there were whisperings in the air of rust appearing in the fields. At first this was not taken seriously, but as the season advanced and the crops were backward in changing from a green to a ripe color, there was more anxiety about it. It was the general topic in every section of the country, and there appeared an absence of safe opinion as to what to do about the crop. The one outstanding fact was that the straw did not ripen up and in the main remained green. It was a puzzling situation for many growers, and there was some indecision as to the right course to adopt—whether to cut the crop or leave it standing in the hope that it would mature. This was a point that many were unable to decide, because they based their judgment as to when the crop was ready to cut on the color of the straw. As the straw did not color up naturally as is usual in a normal season, many fields were left standing too long and were caught by the frost. This whitened or dried (but did not injure) the straw. Then the crop was cut down as quickly as possible.

When to Cut in a Normal Season

In a normal season one can determine fairly well when the crop is ready to cut by the color of the straw as it ripens in the normal way. Many base their judgment on the straw, cutting when it is ripe at the first joint, or

when there is no moisture in the straw just above the bent joint; but this is not always a safe rule to go by. Taking, for instance, the dry season of 1914—the straw ripened prematurely, owing to the hot, dry weather and hot winds early in August, before the berry was fully matured. If the crop had been cut under these conditions when

Fig. 32.—Cutting and Stooking Oats.

the straw was ripe at the first joint, the shrinkage of the grain would have been rapid and the weight and grade would have been lowered. On such occasions it is best to allow the berry to continue development. The reverse of this condition was the case in 1916. The straw was very green and full of sap, and cutting could have taken place much sooner and the development of the grain carried on in the stook.

There is a proper time to cut the wheat crops to secure the best results both in quality and the weight of the grain, and there is also a time when it may be cut to

lower the quality and weight and grade. There is no necessity for any haphazard methods or guess-work.

In the past there has been much discussion as to the reason or cause of spotted wheat or, in other words, piebald grain. There are several reasons for this. Grain left standing until over-ripe will show starchy, piebald grain. Hot, dry weather, causing undue ripening of the crops, is another cause. Grain cut on the green side does not show very piebald grain to any extent. We often use the expression: "To have the best colored, heavy weighing grain it must be cut on the green side with respect to the straw." But there must be some understanding of this matter to secure the best results. The crop may be cut too green or while the straw has a decided green tinge, and the grain may shrink more or less. On the other hand, the straw when cut may be quite green or have a tinge of green, as in the above case, and still may yield fine, plump, heavy grain. In such a case, as I have pointed out, one cannot determine by the straw alone, but must also consider the condition of the berry at the time the crop is cut.

We hear some growers recommend cutting on the green side, while others condemn this practice. One may have cut when the crop was green and secured a fine sample of wheat. The other may have done likewise and found the grain badly shrunken. In both cases it may have been just guess-work, and in another season conditions might prove different.

The only safe guide is to cut the crop according to the condition of the berry, regardless of the color of the straw. These are very important points to observe and should be studied by every wheat grower.

Determining When to Cut

The observant grower will know that when the berry is filling it is of a green shade or color, and as the maturing process goes on, it changes into what it termed the milk stage. At this time, if the crop is in a healthy condition, the milk will be of a clear, white, milky color. As development of the berry is carried on it loses its milky character and goes into the soft-dough stage. Later on, the berry enters the firm-dough stage. As the ripening process goes on it changes into the ripe stage. If the grain is left uncut it goes into a hard, flinty condition as we know it when it is fully ripened and hardened.

These different processes may be observed by the grower upon close examination of the berry. If, when squeezed between the fingers and thumb, it shows any milky substance, it is not yet fit to cut. After the milk stage is passed it will be found by squeezing the berry that a very small drop of water, which ought to be clear, with no milky substance, will squeeze out at the end of the berry and the berry will be found firm. At this stage, if the season is late, it may be advisable to cut the crop, but not before. If it is early in the season it may be left standing until this drop of clear water has disappeared, after which the crops may be safely harvested.

To be sure as to the right conditions for cutting, the smooth side of the berry should show an amber or yellow tinge spreading over it. In some cases this development is carried on until the berry is a creamy white color and the green color disappears. Whether to cut the crop at the time the berry still has the small drop of water, and with the spot of yellow showing on it, or to leave the crop standing until the water has disappeared and the

berry is creamy white and firm, must be left to the individual. He must take into consideration the time of the season, determining whether it is safest to let the crop stand awhile or to cut it, as is done if a frost threatens. With respect to this small drop of water in the berry, when a frost occurs at this stage some growers go into the crop to find out if the crop is frozen, and when they find the drop of water in the berry they will claim the wheat is frozen. This is not correct, for we find it under normal conditions when there is no frost.

I found from a personal examination of many wheatfields during August of 1916 that fields which were considered to be far from ripe by reason of the straw being so green, were at the stage I just referred to. Some were just passing the soft dough stage, and others were in the firm dough stage, while the straw was perfectly green. Hence my statement that much of the loss of the season of 1916 might have been prevented. Some fields were still in the milk stage, while in other fields the straw had a decided green color and looked apparently not yet ready to harvest. The berry was quite firm, with no moisture, and in fine condition to cut.

The Effect of Rust on the Berry

When rust is working in the crop the berry will show it in the early stages, especially when it is working to the detriment of the crops. One squeezing the berry it will be found that instead of the clear, milky substance it will change to a soupy condition or be of a dirty color, which may be compared to soup. When it reaches this condition and the rust develops at the stage in which the berry kernel will slip out of the covering when squeezed, there is nothing to be gained and everything to

lose by allowing the crop to stand. When the grain is cut later and is dried there will be nothing left but the skin or bran.

When the berry is in a normal condition, at the soft dough or firm dough stage, the dough will be plastic and will cling to the covering. Some of the fields that I examined were coming into that soupy stage, while the straw was absolutely green, and others had reached the stage where the kernel could be squeezed out, and such fields ought to have been cut at that time.

Directions for Cutting Summarized

To make the foregoing clear, the best time to cut in a normal season is when the straw is turning a natural ripe color, and while the heads still have a slight tinge of green showing, and when the berry is firm and on being squeezed shows no sign of milk or water, in color being a creamy white. When rust is showing in the crops cut it independent of the color of the straw, whether it is green or partly green or ripe, providing the conditions of the season will allow the berry to become firm, the same as in a normal season. If the season should be far advanced and the berry is still in the soft dough stage, but shows no milky substance, it may be cut although the straw be green, as development of the berry will go on while in the stook. This point may be left to the individual to decide, the main contingency to take into consideration being the probability of frost.

In a hot, dry season, when the hot winds or hot, dry weather forces the crop prematurely, allow the crop to stand until the berry is quite firm and there is no moisture. It should stand as long as possible, but should be cut before the grain becomes too hard. At the time

the berry has reached the best stage to cut in normal seasons the heads will show a swollen appearance and the grain bursts the chaff. The chaff will open up slightly and expose the berry. This may happen while the head still has a green shade and the straw also may have a green tinge. If no moisture is found in the berry it may then be cut to the best advantage.

The point I want to emphasize in respect to the foregoing is that considerable of the loss from rust sustained during 1916 might have been prevented had there been some better understanding of the effect of rust on the wheat crop. Once it has reached a certain stage, if instead of allowing the crop to stand and waiting for the straw to color up in a natural way, as is usual in normal seasons, it is cut while still green, or partly green, better results will be secured. No attention should have been paid to the straw, but a close examination should have been made of the berry, and the cutting should have been done as quickly as possible after it had reached the soft dough stage. This would have allowed for development of the grain while standing in the stook, which would have been carried on for several days longer owing to the juices or moisture in the straw. This would have checked to a great extent the development of rust, which, while the crop was standing, was very rapid, especially where favorable local conditions prevailed. When the berry had passed the milk stage and entered the soft dough stage it would have made a better sample of grain than if allowed to stand waiting for the straw to ripen. In many instances it might have been profitable to have cut it while in the late milk stage, especially where rust was making rapid progress.

The problem of rust and frost is a serious matter and is responsible for serious losses in some seasons. We can never be sure that the wheat crops of Western Canada will be harvested without suffering from one or both of these causes.

Earlier Varieties Needed

As settlement is increasing and considerable new areas of wheat lands are being brought under cultivation the

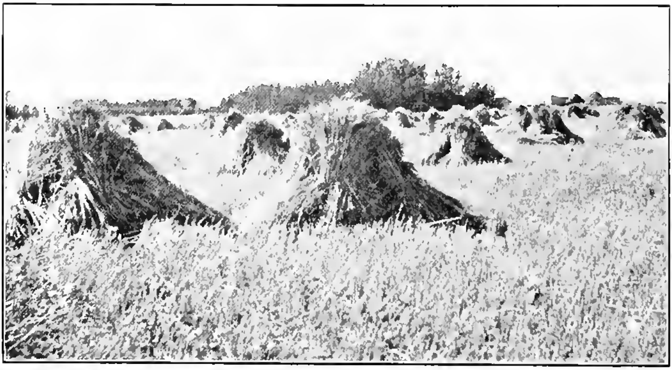


Fig. 33.—Seed Plot of Wheat in Stook.

need for varieties of wheat that can be depended on to mature some time early in August is pressed more and more upon us. The difficulty is that very early maturing wheat cannot be expected to yield as high as the later sorts, owing to the shortness of the growing period and the absence of tillering or stooling characters.

I have realized for many years past the serious need for such varieties and have endeavored to obtain them, both by a search and by seed selections in the field for new types or early strains of existing varieties. I have

been successful so far as early maturity is concerned; but the chief difficulty has been to secure a strain that also possesses high milling and yielding characteristics. I have every reason to expect that one or more of the strains I am now growing can be depended on to mature from four to ten days earlier than Marquis, and correspondingly earlier than Red Fife, and still maintain equally high milling and yielding qualities. Unfortunately, the hailstorm of 1913, and again in 1916, that visited my farm have prevented rapid progress. Much promising material was reduced in quantity, and I was prevented from checking up the effect of both rust and frost on these wheats in 1916. However, the stage they had reached on August 3, when the hailstorm destroyed the crops, left me fairly confident as to their behaviour in the future.

The Oat Crop

The oat crop should be allowed to ripen evenly, and the time to harvest it is determined more by the color of the straw and head, which should be allowed to stand until ripe, when the green shade on the head is gone. If cut in the same condition as advised for the wheat crop, the grain will not be so clear and uniform in color, and some grain will be green. While it should be allowed to ripen off uniformly, it should be cut as soon as possible; if left standing, rains may discolor the grain.

The Barley Crop

The barley crop should be cut when the straw shows a clear, ripened color; but the berry or grain should be firm, though not fully ripe. If the crop is left standing until dead ripe, a high wind will shatter the grain, and

even a slight rain will discolor it. Hardening of the grain should be carried on in the stook.

Six (6) rowed barley shatters more easily than the two (2) rowed sorts, and should be handled carefully to prevent this.

When cut, this crop should be put in stook as soon as possible to protect from weathering of the grain. The same manner of stooking in the round stook as for wheat is recommended. Care should be taken that there are no more than nine sheaves in a stook for two-rowed barley, as the heads settle together very closely, and if the stook is too large this may cause sweating and discoloring of the grain for want of circulation. If set up in long stooks there is more surface exposed to the weather.

Stooking Grain

There are several methods adopted in stooking grain. Some put the sheaves up in long stooks; others in round stooks. I would recommend the round rather than the long A-shaped stook.

There are some advantages and disadvantages in both styles of stooking. When set up in long stooks more surface is exposed to the bleaching and weathering by sun, winds and rains. In the round stook the grain is more protected. It is sometimes advisable to set up oats in long stooks late in the season to hasten hardening of the grain if it is wanted to thresh as soon as possible. Green sheaves for feed are best put up in long stooks to dry as quickly as possible.

Many grain growers set sheaves up in large stooks from 10 to 20 or more in a single stook. Eight or nine sheaves in the stook will be most satisfactory under all conditions.

A good deal depends on the way a stook is set up. When put up carelessly they blow down or settle into bad shape. If they settle into bad shape and go squat, rains will bleach the grain and the stooks do not dry out quickly.

In commencing to build a stook the first two sheaves are set nearly upright on their butts; the next two go at opposite corners, but with a little more slope so that the heads are a little lower than the first two centre sheaves; the next two are set again at opposite corners, slightly lower than the others, and so on until eight or nine sheaves are used in a single stook. When built in this way the stook resembles a cone, the centre higher than the outside sheaves. The stook should be round and balanced in shape so that when it settles it will be a compact cone shape.

Such a stook will not blow down very easily, as is the case with the long stook. In such a stook the grain is protected, as there is less surface exposed. The inexperienced will likely set the sheaves too upright, and the stook, instead of being pointed, will be more square at the top; but a little practice will make one perfect.

When large stooks are made one runs chances of spoiling the grain. If set up in large stooks, and more especially if capped while the grain is soft, and the weather turns warm and rainy, the inside of the stook will sweat and probably heat for want of circulation of dry air. In seasons of heavy rainfall at this time the grain may sprout and grow; while under equal conditions the smaller, round, pointed stook will be in good shape.

Where long stooks are made they should be set up north and south, not east and west. If set up east and

west and rains come at the end of the season, the stooks do not dry out quickly, as practically no sun gets around to the north side of the stook; whereas, set up north and south, they get the morning sun on the east side and the afternoon sun on the west side. The advantage from winds applies in the same way.

Capping of the stook is of doubtful advantage. Even the best fitted cap may blow off sometimes. In high winds, accompanied by rain, these cap sheaves may sprout and grow if left on the ground and this necessitates going over the whole field to gather up cap sheaves. If left as they lie in a sprouting condition and afterwards threshed with the better grain, the grade will be lowered.

CHAPTER XIV

Farm Implements

In this chapter I shall treat only of those implements that are indispensable for growing grain, namely: the plow, packer attachment for the plow, soil packer, drag harrow, the cultivator, disc harrow, grain drill and the binder. These implements for the tillage of the soil and the seeding and harvesting of the crop are indispensable to growing grain for profit. There are other implements which may be added to the farm for special work as desired.

There are many different makes and styles of the implements I have mentioned, and in the choice of any of these implements one should have some general idea of the work to be done and those most suitable to do it. No one implement will suit every condition of soil; the plow that may be suitable for one kind of soil may not be so suitable for another kind. The time and place to use must be left largely to the individual who is acquainted with local conditions. Under these conditions one can hope, therefore, to be able to make only a few suggestions that may be of service to the reader.

The Plow

There are different kinds of plows—the walking plow for breaking prairie sod and for stubble plowing; the

sulky plow, also suitable for this work; the gang plow, of two or more bottoms; all mouldboard plows; also the disc plows. Where the soil is of such a character that it will not allow of free passage through it without filling up, then the disc plow is more satisfactory; but where the mouldboard plow can be used, better work can be done.

Where the beginner first goes on the land with limited capital, the walking-breaking plow, combination plow so called, does excellent work. These combination plows are equipped with a breaking bottom interchangeable for a stubble bottom; so that the one plaw can be made both to break the sod and plow stubble land. The combination plow, with iron beams, is more suitable than the long wooden beam. Where there are hummocks and light hollows in the land, the combination plow follows the surface better and allows of turning over a cleaner furrow, while the longer beam on the other plow cuts off the hummocks and misses the hollows. In breaking prairie sod it is important to turn over all the soil. (See Chapter III—Breaking and Backsetting—Page 57).

Where it is possible, the sulky plow may be used for breaking sod, and with stubble bottom it can be used in plowing after the first crop is taken off. Later, when the farm is broken up, the gang plow may be added to the farm.

When a sulky plow is used the size of the bottoms should be given some consideration; either a 16-inch or 18-inch mouldboard should be used for stubble plowing, and 14-inch bottom for the breaking. Where there is sufficient power a gang plow with 12-inch or 14-inch bottoms may be used for breaking and 12-inch or 14-inch for stubble plowing. Too often a 14-inch gang is used

when it would be more profitable to use a 12-inch bottom. Naturally, one wants to turn over as much plowing in a day as possible, and very often when it is wanted to plow six to eight inches the team is unable to do so if a 14-inch is used. A 12-inch bottom would be more satisfactory. While the 14-inch bottom turns more plowing per day, the 12-inch does better work. In plowing shallow for cultivation work the 12-inch turns a neater, cleaner furrow, while, particularly if the soil is dry or weeds growing on the land, the 14-inch does not turn the furrow so completely and it breaks in turning over and only a cut-and-cover job is done.

For plowing the average prairie loams one should choose a plow with a low-down mouldboard rather long and sloping, instead of a short mouldboard with an abrupt turn; the latter does not turn over shallow furrows so well as the longer low-down mouldboard. In some heavy soils it is necessary to use the abrupt mouldboard to break up the furrow as it is turning over; but for medium, average and light soils the other kind is more suitable. The furrow should roll over and not break too much. Some styles of plows throw the furrow endways instead of rolling it over. When it is thrown endways it leaves open spaces in the soil, and under our conditions this should be avoided as it admits the air too freely and evaporation takes place too rapidly. This happens when the abrupt, short mouldboard is used if the soil is getting dry.

The choice of the kind of plow must be left to those who know these soil conditions. There are many opinions as to which kind of plow is best to use. I am writing from my own experience on this subject and will leave it thus.

The Plow Attachment

There are several different styles of attachments for the plow to press down the plowing at the time it is turned to prevent moisture evaporating from the soil as much as possible. Some use a section of the harrows; others, rotary harrows and soil packs—both surface and sub-surface styles—on the principle that all soil that is stirred evaporates some moisture.

I am a strong advocate of only those that press down the freshly turned soil rather than those that pass through the soil. This is not so important when plowing the summer fallow or fall plowing; but it is important when plowing in the spring at the time a seed bed is prepared, just previous to putting the seed in the ground. As the seed is to be put in the upper one-to-two inches there should be as little stirring of the soil as possible; the heavy drag harrow will often rob this portion of the necessary moisture to germinate the seed and get it established.

A small roller will answer just as well as the small packer; but I am not aware of any available on the market. Some years ago I used a home-made small roller, but later, when the small packer was introduced, substituted it in place of the roller. They can be attached to either the gang or sulky plow. There is little or no appreciable extra draught or side draught and no grain grower ought to miss the opportunity of attaching one of these small implements to the plow. Providing there is moisture in the soil at the time the plowing is done, it will ensure germination of the seed. It is not intended to pack down the furrow slice so much as to press down the surface to conserve moisture.

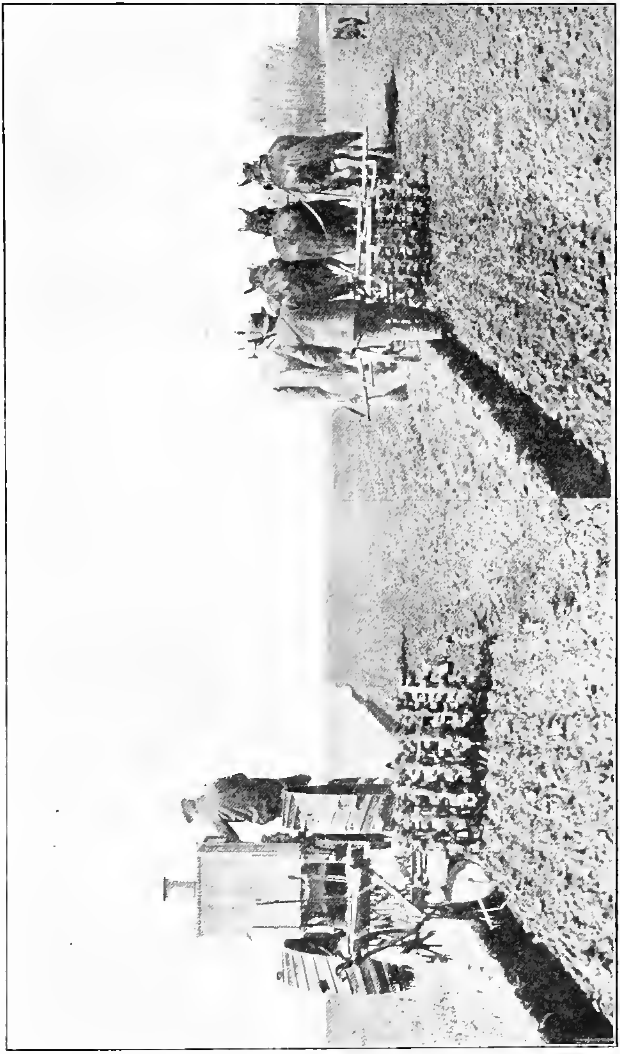


Fig. 34.—The Packer Attachment Plays an Important Part in the Conservation of Moisture.

The most important time to use it is in the spring plowing, but it can be used any time plowing is done, and it paves the way for the other implements used after the plow. The cost is so trifling that no one can afford to be without it. One has a choice of either the sub-surface style or the surface style.

There is food for thought here. The sub-surface style consists of narrow, thin wheels. The object is to press down the lower portion rather than the top; this admits air in the soil. In plowing in the spring for a crop we don't want any air let into the soil. The surface packer presses down the surface and admits no air to the portion below. On any other kind of plowing this is no consideration. Therefore, in choosing the kind for general use the surface style is best adapted for spring plowing for a crop and will answer for any other plowing to be done. The cost of these small attachments is so trifling that one ought not to be without one.

In 1917 there were considerable areas that were seeded on spring plowing where the seed lay in the ground waiting for rain, which did not come until late in the season, and in 1918 in some districts the same thing happened. How many thousands of dollars were lost to the farmers who could have prevented this loss? In some instances, where the soil was dry at the time of plowing, this could not have been remedied, but in the majority of cases it might have been. Plowing, harrowing, putting in the seed—no packer attachments; no soil packers used! I traced a number of cases to this cause. The small packer behind the plow should be on every farm in the West.

The Soil Packer

Any reference here to the soil packer means the larger, heavier packer—not the small packer attachment for the plow. This is another indispensable implement.

Until within the last year or two a large number of soil packers were on the farms, but never put to use. In discussing the matter with many farmers I found that they had acquired their packers and only used them a short time before discarding them, giving as a reason that they saw no appreciable benefit in their use. So they had used them only once or twice, then left them standing idle in a corner of the farm. One could buy one of these packers for a mere song. To-day if one wants to get the use of a neighbor's packer, it is not available as the neighbor is constantly using it, particularly in the spring at seeding time.

This is a good sign, and in general the farmers appreciate the value of a soil packer. When first used on the farms one cannot see any appreciable benefit and one is apt to condemn the packer as a heavy, useless implement to pull around on the land at a busy time. If one watches closely the effect on the soil and the crop, however, one is soon converted. Once used, always used—in season, of course. There is a time to use it and a time not to use it. Soil packers should only be used when the soil is moist and not too wet, when the surface is dry enough not to clog the packer. If used when the soil is wet—not merely moist, but wet—it may do more harm than good; but these conditions are seldom met with. In an unusually wet spring it is sometimes advisable to dispense with its use when the seed is put in the ground, as it will compact the soil too firmly and cause it to bake. The time when it can be used to great advantage is on

the spring plowing, following the plow with the small attachment to pack down the furrow slice, and again following the seeder. (See Chapter X—Spring Plowing—Page 138). It can be used at the time the summer fallow is plowed, in fall plowing and on sod.

There are three styles in general use. The sub-surface packer has thin, narrow-shaped wheels set wide apart to press down the lower portion of the plowing. The surface packer differs in construction, having wheels with fingers or flanges set at right angles to the rim; they cover more surface of the soil. There is also the combination packer, a style between these two; also the corrugated roller-packer. The sub-surface style is the best to pack down the plowing, but the surface packer is more serviceable to pack down the seed when put in the ground. As one can afford to use only one style, I would recommend the surface packer. For the small farmer who farms only a quarter-section and has a small working outfit, the eight-foot size is very satisfactory, as it covers the ground seeded by the drill and does not require extra teams. When the larger sizes are to be used, the flexible style is better than the more rigid styles, as it can follow the surface of the ground more satisfactorily.

The Drag Harrow

The drag harrow may be classed as one of the most indispensable implements on the farm. It has been in for many generations, long before the grain drill, packer, cultivator, binder, threshing machine or disc harrow were dreamt of. No other implement can take its place on the farm. It can be made to cover a large area in a short time. Used judiciously in the right place at the

right time for pulling down the plowing, eradication of weeds while small, breaking up the crust that forms after heavy rains and constructing and maintaining the necessary mulch, it is indispensable. It is sometimes responsible for injury to the soil when used on the summer fallow, for drifting of the soil, but only when used out of place. Drag harrows are often used too freely on spring plowing previous to seeding, and are responsible for poor germination of the seed when better results would have been obtained if used after the seed was in the gronnd. and not before.

There are several different styles, but they perform the same work. They can be used to good effect when the plowing of the summer fallow is done, and again when weeds are showing and while very small—excepting the grasses, volunteer grain, wild oats and thistles—on the fall plowing, and early in the spring on any land prepared the previous season for a crop, just previous to seeding, on new breaking and backsetting. But often they are used too freely after the seed is sown and cause drifting of the soil. To get the best results from the drag harrow some judgment is required in using them to the best advantage.

The Disc Harrow

The disc harrow is also one of the indispensable implements. In common with the drag harrow, it is often used injudiciously, out of place and time. Disc harrows are guilty of causing considerable soil drifting when too frequently used on the summer fallow. They are often used to destroy weeds on the fallow, and seldom make satisfactory work there, although they may be used to good purpose at a time when the weeds are very small.

Too often the weeds and volunteer grain are allowed to get so established that in order to root them out the discs are set at too acute an angle and the fallow is loosened up too deep; thus has many a good fallow been spoiled, and often many weeds and much grain are left untouched so that the following spring high winds play havoc with the soil. It is very seldom that disc harrows can be used to advantage on the summer fallow. They do good service in cultivating stubble fields to conserve the moisture and to encourage weed growth; also for cutting down sod on breaking and backsetting—there is no other implement can work so effectively. The proper place, then, for the disc harrow is for cutting up breaking and backsetting and for cultivation work in the stubble fields in the fall.

When used on the summer fallow late in the season disc harrows are responsible sometimes for weedy crops. The small-seeded weeds that have had their seeds buried deeply at the time the fallow was plowed are brought again near the surface and do not germinate freely at that time, but will do so after the crop is sown. On old lands the disc harrow should be used with discretion.

Within the last few years much improvement has been made with this implement. It is now made to cut more uniformly instead of ridging the soil. Made in large sizes or widths, it covers the ground more quickly, particularly the tandem or double-disc, which cuts a double stroke at one operation. The time and place to use the disc is new breaking, backsetting, at the time of plowing back the sod after the first or second crop, cultivating stubble fields or plowing done when dry with the soil hard and lumpy; sometimes when plowing under a thick crop of wild oats or other weeds, the soil then being in

a soddy condition. Disc harrows may be used lightly late in the fall to corrugate the summer fallow, leaving it that way without harrowing; in this case disking only one and a half to two inches uniformly over the field. The disc is never to be used (excepting under special conditions) on the summer fallow to destroy weeds, thistles or grasses, or in the spring—the time of high winds, when the soil cannot settle firmly for want of heavy rains. Disc harrows may be used with discretion in the fall on plowing where necessary. This applies particularly to districts that are exposed to the winds. In sheltered districts, bluffy areas, they may be used more freely when it is necessary to do so.

The Cultivator

The day of the cultivator is coming, and it is rapidly replacing the disc harrow for cultivation of the summer fallow and cultivation of the stubble fields. It is an improved form of the old-style spring-tooth harrow. There are many uses it can be put to, making it practically indispensable to every farmer.

The cultivators now in use are so constructed that either the spring or rigid diamond points and duckfoot blades of different sizes are interchangeable to permit of many kinds of work. The teeth of different sizes may be used with good effect in cultivating stubble fields on the summer fallow to maintain the mulch after heavy rains, to open the soil at the surface in order to aerate it and encourage weed and volunteer grain growth to be destroyed by changing to the duckfoot.

They are very serviceable in the destruction of the winter annuals in the late fall on the summer fallow, and do this work more satisfactorily than it can be done

by any other implement, excepting the plow. While weeds are small, the points may be used; when too high for the points, the duckfoot can be used. The cultivator is destined to play a more important part on the farm in the future when it is better known. It can be used very effectively without destroying the texture of the soil; in fact, it will improve it.

There are several different styles, but all are made to do good work. When the duckfoot is used it is very essential that the surface of the field be made uniform previously. This can be done by the plank drag in order that the sweeps or blades may cut uniformly just below the surface; if there are any small depressions, or the field is not uniform, they will miss these and skip the weeds. Where the teeth or points are used in cultivating the fallow or stubble fields, they do the work more effectively if used down the field one way at the first operation and then by crossing the other way the second time. If the field is made uniform for the duckfoot, one operation only is necessary. The cultivator is going to play an important part in grain growing, as already stated.

The Grain Drill

There are three styles of drill in use at the present time—the disc drill, both single and double disc, the shoe drill and the hoe drill. No one kind of seed drill will work well under all conditions of soil. A few years ago the drills in general use were the shoe and the hoe drills.

When the disc drills came in they largely replaced the shoe and the hoe, whether wisely or not is open to question. The fault lay more in not fitting the soil for the passage of these drills. Stubble, plowed under at a shallow depth, interfered with the passage of these drills,

especially the hoe. When the stubble is buried under properly, at five or six inches or more, and the soil packer is used to press down the furrow slice and is followed by the plank drag, then the soil is in better shape to allow free passage of either the shoe or hoe drill, and the seed can be put down at a uniform depth. Too often the plowing is done in the spring and harrows used freely, while the drill is put on the field without any firming of the soil. Under these circumstances the drill cannot work to the best advantage.

The shoe drill will work very satisfactorily on the summer fallow when the top portion of the soil is loosened. But on breaking or fall plowing or summer fallow that is hard or too firm it cannot be expected to penetrate the soil evenly; consequently, much seed is left near or on the surface and uneven germination takes place. One objection to the shoe drill is the narrow track it makes and the cramping of the seed.

The hoe drill has been discarded for the disc drills, and yet I know of no more satisfactory drill on the summer fallow and breaking. On the spring or fall plowing, when the land has been properly fitted, it works well. It differs from the shoe drill in its passage through the soil and in the wider row made. In passing through the soil it works like the cultivator and scatters the seed in a wider drill row.

With respect to the disc drills, the single disc is somewhat responsible for blowing out of the seed. It leaves the soil too loose. It does not work more satisfactorily than the shoe drill where there is stubble met in the soil. When used on breaking it often leaves the seed too near or at the surface. The same applies in any firm soil. Many prefer the single disc drill, giving the reason that

they destroy some weeds at the time of seeding. This is no sound argument, as a properly fitted soil, ready for the seed, should be previously cultivated to a depth of one and a half to two inches at the top before the seeder is put on the field. When this is done any kind of drill will do good work.

The double disc drills, excepting where the soil is too wet, will do excellent work, especially on the summer fallow. They do not loosen the soil as does the single disc. In some styles of both single and double disc drills the seed is dropped too far back to the rear and is not properly covered. The better styles are those that drop the seed well forward to ensure covering of the seed. I know of no better drill than the discarded hoe drill. When used properly, it deposits the seed well forward and it is covered; the packer completes the work. The packer is of no benefit to seed lying near the surface; it will lie there until rains come and there is uneven germination. I would place first the hoe, then the double disc drills as the most satisfactory to use.

There is a great need for an improvement in seed drills. Just so long as there is no demand for this improvement just so long will the manufacturers continue to make the present styles of seed drills. Great improvement can be effected by a furrow opener of wider width than those now in use—to give each individual seed individual space. We want the seed broadcast under the ground in three or four-inch rows instead of a narrow row. The shoe drill makes a narrow, V-shaped track and the seed is crowded and the weaker plants suffer. The empty spaces between the rows allow weeds to get a footing in the crops.

Instead of this crowding of the seed by present drills in use, if each seed were a half or one inch apart in wider rows we could expect an increase in yield, more vigorous, healthy plants, more stems per plant, larger heads, better grains and more grains. A drill with a hoe opener, widening at the back to widen the drill furrow, a proper arrangement in the hoe to scatter the seed in its passage down the feed tubes, and a covering attachment behind, this followed by the surface packer—such a drill would make for larger yields, the drill rows to be at least two to three inches in width, with the seed scattered in the drill rows. The hoe drill comes nearer to this arrangement than any other drill. Placing shoes over the hoes, to allow of using a shoe when desired, would still further improve the drill I have described. Such a seed drill could be used effectively under more varied conditions of soil than those now in use.

Some drills have press wheels following behind to pack in the seed. These can only be used in some seasons when the soil is dry enough. If used when the soil is too wet they do more harm than good by packing the soil too firmly, causing baking of the soil. The use of a drill like the one described above would do away with the need of wheels, as the surface packer does this work very satisfactorily and can be used or not as required.

The Threshing Machine

The threshing machine should have a place on every farm, and it is to be expected that practically every grain grower will soon have his own small thresher. This will enable him to thresh the crops when ready without waiting for the custom thresher—enable him to get the crop threshed in good time and condition and allow of more

work on the fields in the fall. The small thresher is now within the reach of many farmers, and is also very necessary on the farm.

The plank drag is also an excellent addition to the list of indispensable farm implements. (See Chapter V—The Plank Drag—Page 83).

The binder is too well known to need any description.

CHAPTER XV

Improving Crops by Seed Selection—Mass Selection

Exceedingly important is the part played by seed selection in crop production. This is scarcely sufficiently realized by the majority of grain growers. It is equally important whether we select our own seed or use seed selected by others. Better seed means better, surer and safer crops. Our average yields are low, but could be increased very materially if only selected seed or the near progeny of pure seed was used.

There are two classes of seed growers—those who originate high-class seed by selection or plant breeding, and those who grow or multiply this seed. There is also the grain grower who grows indifferent or poor seed, scrub stock of mixed populations or mixed varieties. This seed results in uneven germination, growth and ripening; one of the mixtures will germinate sooner, grow quicker and mature earlier than the others, while another may grow taller or shorter. This mixture of varieties results in reduced yields and uneven grade.

Good seed, especially seed with a pedigree, can be depended on to show a uniform germination, growth and ripening, higher yields, better quality and grade. This stock, selected from the most vigorous plants, can hold its own in the field under unfavorable season factors. Plump, sound seed of high germination makes for rapid growth

in the early part of the season when conditions are most favorable. At an early stage, when the stems are from six to ten inches high, the heads are already forming in the stem before it is seen in the shot blade, and once the heads are formed there is nothing that can add one or more spikelets to the head. The head may have any-

Fig. 35.—Hand Selected Marquis Wheat Sown on Brome Sod.

where from one to ten or twelve pairs. Whether each spikelet completely fills will depend on conditions at the time of fertilization. A spikelet may contain two or four or six grains.

Every grower should make it part of the farm work to sow only good seed of high pedigree. This may be got by seed selection, and, if done with a conscientious desire for improvement, far-reaching results will soon be in evidence. If all the grain growers in Western Canada were growing only selected seed, the increase in yield would add anything from 50 to 100 million bushels to

the crop in a single season. We have all kinds of proof by actual experiment and investigation, covering several years, that good, sound seed of high pedigree and purity will largely out-yield ordinary seed under equal conditions. Undeveloped or frosted seed of high pedigree will give better returns than plump seed of the ordinary run of more or less mixed varieties.

I would refer here to the Macdonald-Robertson competition, lasting from 1900 to 1902. Fifteen hundred boys and girls on the farms throughout Canada entered this competition, but only 450 completed the work. Each boy and girl was required to operate a seed plot of a quarter of an acre of either wheat or oats and make head selections from the plot sufficient to sow a similar plot the following season. Prizes were awarded according to the weight per kernel of 100 heads, careful records were kept each year, and in the following table the average results are given for all Canada on spring wheat and oats.

It will be noted that in the case of wheat there was an increase of yield of 10 bushels per acre in three years, and for oats an increase of 20 bushels per acre. With such gratifying results obtained by the boys and girls on the farm it may easily be seen how the interested grain grower may also increase his yields.

Year.	Average number of grains per head.	Average weight grains per head.	Average yield per acre in bushels.
WHEAT—			
1900..........	42-9	142-9	25-32
1901..........	46-9	162-6	30
1902..........	51	188-3	35-44
OATS—			
1900..........	116-9	301-6	54
1901..........	121-2	343-6	59
1902..........	140-2	385-5	73

Seed Growers' Association

Out of this competition the Canadian Seed Growers' Association was formed, and is in existence at the present time, and any person interested in the work of seed selection may take up this work and become a member by applying to the secretary of the Association at Ottawa.

How Purity Pays

If the above yield was increased by one bushel per acre it would add to the wealth of the farmers who grew

Fig. 36.—Hand Selected Plot of Victory Oats Heading Out.

this grain over forty million dollars, and if every seed sown was good pedigreed or selected seed it would easily be increased by five bushels per acre. The above figures are somewhat startling, and it does not call for a great stretch of imagination to realize what the farmers are losing each season. This statement is based on my own

experience in seed selection, without any attempt at exaggeration. The present yield could easily be increased by at least two bushels per acre, and in many individual cases considerably more.

We have not yet touched on the fringe of the possibilities in crop production, and when the big majority of the farmers realize the full value of growing only carefully selected seed it will mark a change for the better in the financial standing of the farmers of Western Canada. We may reduce the cost of production and add to the profits each season by the use of better seed and better methods of tillage and cleaner crops of higher quality. I had the opportunity not long ago of watching the grain inspectors at Winnipeg sampling and grading a number of samples of wheat that passed through their hands; these were representative of carlots of grain from the three Western Provinces. What impressed me very forcibly was the fact that there was not one lot that could be called a good sample. Practically every lot sampled was a mixture of different varieties and contained more or less of other grains, such as oats and barley, besides all kinds of weed seeds and impurities. Farmers surely have not yet realized what they are losing each season by paying freight on these impurities that should be fed on their own farms. By following up some system of seed selection on the farm or by the purchase of selected seed from some other grower and a careful system of grading up carlots before shipment they would add considerably to the wealth produced on every farm. The increase in profits when sold on the market will be from the extra yield obtained and the higher quality of the progeny of good, selected seed.

If properly grown for seed purposes, grain is worth at least double the market price, and the actual worth will be according to the quality and standing of the pedigree when sold as registered seed. When one is not inclined to produce registered seed, improved seed may be grown and sold as such at a higher price than would be obtained on the market. Whether growing grain for the market or for seed purposes, one can be assured of a profitable return for the labor and effort expended.

Laying Down Seed Plots

For the benefit of the farmers who may be interested I want to explain the principles and methods of mass selection of grain in the head, the best type to select, and the threshing and cleaning process to maintain the purity. Mass selection is the easiest and the best system in general to adopt. It is the most simple and effective, and is within the possibilities of every grain grower. The most important and essential point to observe is to be sure that the variety under selection is pure and free from other varieties. While one may start out with varieties that are grown on the farm, there is a great possibility that false selections may be made, and this will lower the value of the work in hand, and increase instead of decrease the admixture of other sorts.

Uniformity of Type

The object in seed selection is to purify the variety, to bring about uniformity of type, to select the most vigorous and high-yielding strains, to eliminate all other types and varieties, to raise the standard and quality, and thereby increase the yield. It is easy to understand, therefore, that it is important to start out with good

foundation stock. To make this point clear it would be well to point out how false steps may be made, and some years of labor lost. Take Marquis wheat, for instance. This variety has a number of variations; that is, forms that are not true. In common terms these are called sports, and are inferior to the original type. On close examination they are distinct with respect to the shape and size of the grain, time of maturity and the character of the straw. Where one cannot distinguish between these variations and the original type, it is not possible to make any real improvement. This applies also to Red Fife and other varieties, although the variations may not be so numerous. Barley and oats also show variations where no selection has been made.

While the first cost of pure seed is apparently high, it is really the most economical plan to purchase pure lines at the start for foundation stock. It lessens the possibilities of making false selections and a beginner can go right ahead and select the best heads from the plot.

Use Clean Land Only

Having procured foundation stock seed sufficient to sow one-quarter of an acre, and I would not recommend operating any larger plot at first, the next step to consider is the most suitable place to sow the seed in. Under no consideration should it be seeded on stubble-plowed land or where any grain crop has been grown the previous season. Good, clean summer fallow, potato land, new, well-worked breaking done the previous season, or clean garden land should be chosen. Any nice clean ground that is in proper condition is suitable. The plot should be situated not too far from the home, so that it

can be under observation from time to time. The shape of the plot may be square or oblong. It should not be too long and narrow.

Before putting the seed in the grain drill, the seeder should be overhauled and cleaned of any grain left over from the previous season to avoid any mixtures. The seed should be treated to prevent smut. When the plot is headed out it is advisable to go through it and pull out by the roots any variety or forms that are not true. The plot should be allowed to ripen thoroughly, when the selection of the heads may be made. No heads should be gathered while damp or wet with dew, as may be the case early in the morning. At noon an hour can be well spent in selection, but the heads should be all gathered at one time if possible.

There are several methods of seed selection, but the one I am confining this chapter to is known as Mass Selection. It is the method most adapted to every farmer. After having worked along these lines for several years, and knowing that absolute improvement has been made each season, I can say that this form of selection is profitable and will repay for the trouble taken, whether the object is raising seed grain or grain for market.

Before attempting to hand-select any variety it is very advisable to choose one that is suited to the district. Having decided this point, secure the purest pedigreed seed and sow on a special seed plot. (See Chapter XVII—Seed Plots and Their Preparation—Page 232).

For a quarter-acre seed plot 20 to 25 pounds of seed is necessary, according to the character of the soil and the district. After the grain is well out in head and beginning to fill, the plot should be closely inspected to note

if there are any foreign grains or types. While there ought to be none, there is always a possibility of these creeping in through several agencies — for instance, gophers or mice may carry and store grain from a nearby field the previous fall. Pulling out of these foreign types

Fig. 37.—Marquis Wheat Grown From Hand-selected Seed.

is known as "roguing," and the intruders themselves are known as "rogues."

To do this work it is best to take a morning when the grain is not wet from dew or rains. Take about four or six drill rows at a time, by straddling the drill row, and work under or toward the sun. In the evening while the sun is still shining is also a good time. By looking toward the sun one can see better if there are any bearded kinds of grain and other foreign grains. When the end of the plot is reached, take the next few drill rows; this

enables one to keep tab only on those rows immediately in front as one passes through the plot.

It is necessary to do this at different stages of the crop until ready to cut. A little experience will enable one to do this work thoroughly. It is important to pull the whole rogue, or plant, out by the root. Picking off the heads will not ensure freedom from rogues, as there are some low stools on the plant out of sight. Bear in mind that the small seed plot is simpler and easier to rogue than the larger, multiplying field.

Everything depends on the purifying of the seed plot. If any plant escapes notice, and is of another variety or of some other kind of grain, it will increase rapidly the following season when the seed from the seed plot is sown.

When the plot is ripe it is time to hand-select the heads sufficient to seed another similar plot the following season.

Type to Select

Selection should be made from uniform heads true to the variety. At the outside of the plot may be found plants that grow stronger and taller than are found in the inside of the plot. These heads are larger and longer but more open in the head. They usually do not contain more grain than the smaller, more compact heads from the inside of the plot, and do not fully mature with the rest of the plot. The grain will be found to be thin and shrunken. Therefore, there is no advantage in selecting these large heads, because they will not reproduce similar large heads for the following season. The reason for these large heads is in the advantage they have in growing on an excess of plant food and moisture from the bare soil that is found on the outside of the plot. It is a case

of environment. When mention is made of selection of the best heads, it should be understood that it is the largest heads or best heads from the inside of the plot, where no one plant has an advantage over the other. In most cases the best heads are the largest, but not always the longest ones, because they are more perfectly filled from the base to the tip of the head. A well-developed head should contain at least eight or ten spikelets on each side, with more than two grains in a single spikelet. A spikelet may contain from two to six grains, and a single head sometimes as high as 75 grains.

There are well-defined types among all plants, and these, when propagated again, come fairly true to type. Every variety is known by the type. Some are loose and open in the head, with spikelets far apart. These are known as open type. In the compact type the spikelets are set closer together, making a compact head. Many of the compact type that may seem small in the head as compared with the longer open types contain more grains, and I find there is less loss by shelling of the grain in handling.

The best type to select is the compact one and should be made from heads that are fully developed, every spikelet, from the bottom to the tip, being filled. It would be well to explain here that in some seasons the bottom spikelets do not fill. This may be due to conditions caused by the season. In abnormal seasons, such as those in which severe June frosts affect the head even before it was in the shot blade, incomplete filling is caused. This is not due to the inferiority of the individual plant or variety, and due allowance should be made in this and similar cases, such as when a slight hailstorm strips a few grains out of the head or damages it before filling.

But when the season is normal and the plants all grow under equal conditions, it is advisable to select the best developed and largest heads, because such a large head will contain plump, sound grains. Like produces like. To a great extent a normally developed head and grain makes better seed under all conditions, will produce more abundantly, and is far superior to the weaker types.

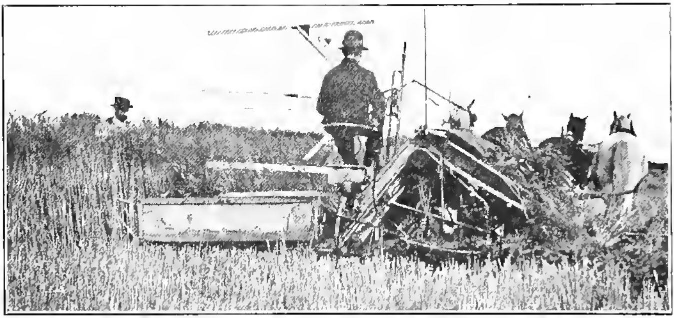


Fig. 38.—Cutting Preston Wheat, a Discarded Variety.

This does not hold good in a case of pedigreed seed that through some accident of the season may produce apparently inferior seed, because shrunken, under-sized seed from highly selected stock is more valuable than bright, plump seed from inferior stock.

There is also a wide difference between the different strains as to their ability to stool freely. This applies to different varieties as well. Some varieties stool more abundantly than others, but this also happens within a certain variety in the different strains. Some of the strains produce only a small number of heads, others a greater number. Others again are not uniform in stooling, throwing up stems of different heights, while some

are very uniform in height. These better stooling types must not be confused with those growing at the outside edges of the plot.

Having pointed out some of the wide differences between individual plants and their ability to reproduce, it should be clear to the beginner that it is possible to make a selection of better and more profitable strains and to eliminate all inferior strains. The first year of selection will show some improvement, but each succeeding season a more marked improvement will be noted, because selecting the best each year leaves less of the inferior type to be eliminated and more uniformity of type will be the result.

Selecting the Heads

Selection of heads should be made when they are fully ripe. Choose a warm, dry day, if possible. Any dry day will do, excepting windy days, when the heads are moving about too freely. It is a good plan to carry a large-sized pail on the arm, and with a sharp knife cut just below the head. Each pailful may be emptied into a sack. Three or four sacks should be sufficient to give seed for a quarter of an acre seed plot. These sacks should be emptied into other sacks, so that each is little more than half full. These are then hung up in a dry, airy place until such time as they can be threshed. It is well to shake up the heads in the bags sometimes to air them until thoroughly dry. When time permits, the sacks should be laid on a hard surface and beaten with a stick. When thoroughly threshed, the broken heads and chaff may be taken out by a suitable screen shaken over a box or washtub. A windy day should be chosen so that the chaff that falls through with the grain will be

blown out. All the small grains should then be screened out, leaving the best for seed for the next season's seed plot. This seed will be pure and free of any weed seeds.

The balance of the plot may be harvested with the binder, taking care to see that no heads or straws are in the machine or on the canvases. Regarding the threshing of the plot, some judgment is needed to avoid any

Fig. 39.—Plots of Wheat and Oats in Stook.

mixtures. If one does not own a small thresher it should be threshed after a similar variety, having the threshing machine run empty for a short time to clean it out as much as possible. It is well to discard the first bushel that goes through.

The amount of seed from the seed plot will vary according to the yield, and should be sufficient to seed at least five acres the next season. Care should be taken in the cleaning of the seed to maintain the purity. A special field should be prepared for this seed, such as a clean summer fallow. This will be the multiplying plot. The seed from the plot will be sufficient for the general crop the following season.

The amount of heads required to sow a seed plot the following season refers in this chapter to wheat, barley or rye. With oats the heads may be cut off with about a foot length of straw and tied in convenient-sized bundles; the same may be done with the other grains, if so desired. They should not be cut longer, as in bending down while in the crop to cut off the head injury will be done by breaking down the surrounding heads. When a good-sized bundle is made, tie about one-third from the end of the straw so that the heads are not bunched too closely. The bundles should be hung up in a shady place to prevent heating or mould. The heads may be hung downwards, and when the grain is to be separated the heads may be cut off and placed in a sack and threshed by pounding with a stick.

CHAPTER XVI

Selection of Seed—Head Row Selection as I Know It

Every kind of crop that is being grown to-day has a history. All the small grain crops we now grow were originated or introduced by some form of selection, by either natural or artificial means. In the far distant ages, in the time of the Pharaohs, wheat crops were grown. The Chinese were growing wheat 2,700 years before Christ. It was cultivated by prehistoric races that are now extinct, as far back as the time of the Swiss Lake dwellers. It is a long step from then until now, and it would be interesting to follow up the changes in the crop from then to the present time. A few years ago Dr. Aaronson, of Palestine, discovered wheat growing in a wild state in Palestine. To-day it is our most important crop.

As far as Western Canada is concerned we can know something of the development of this crop and can note its improvement; the same with the other small grain crops. Red Fife wheat, that is world-renowned for its high milling and baking qualities, was a selection made by David Fife, then living in the township of Otonabee, in Upper Canada, which is now known as Ontario. He secured some wheat from a friend in Scotland in 1842—taken from a cargo of wheat direct from

Dantzig, Prussia. Not knowing whether this wheat was a fall or spring wheat, he seeded it in the spring and it proved to be winter wheat. Only one plant survived, and it had three heads. He carefully saved the seed and the increase was grown throughout the United States and Canada until the present time—a simple matter of selection. He might have neglected to save this seed

Fig. 40.—Head Row Plot of Kitchener Wheat.

and, had he done so, who can tell whether the Prairie Provinces would be so widely populated or prosperous as they are now? Probably not.

Leading Varieties of Grain

All the different varieties of small grains grown in Canada were originated by some form of selection. Marquis wheat would be unknown to-day but for Dr. Chas. Saunders, who, in the course of his work of plant study

and selection, discovered the merits of this wheat. Originally Red Fife was one of its parents. Stanley, Preston, Huron and other hybrid wheats that used to be largely grown were the result of selection done on the Ottawa Experimental Farm. These are now almost wholly replaced by Marquis wheat.

O.A.C. No. 21, Manchurian and Wisconsin pedigreed barleys were originated by selection from a variety known as Mensury—all improved types from the parent stock. Professor Zavitz, of the Ontario Agricultural College, Guelph, produced the O.A.C. No. 21 barley; Dr. Charles Saunders, the cerealist of the Ottawa Experimental Farm, the Manchurian; Professor Moore, of the Wisconsin Agricultural College, the Wisconsin pedigreed barley.

Banner, Victory, Ligowo, Abundance and other leading varieties of oats, have also been originated by selections and improvements on the original types.

Kitchener wheat, Red Bobs wheat and some forms of winter wheat were originated on my own farm by simple plant selection. All these improved forms may be replaced at some time by even better types. There is no standing still. The weak is crowded out by the strong. Red Fife is crowded out by the Marquis; the Marquis in turn may be displaced by improved varieties.

Not long ago yields of wheat of 40 to 45 bushels per acre were considered high. Marquis raised these records to 50 and 60 and on up to 81 bushels per acre; Kitchener wheat, 80 bushels. It was rare to hear of oat yields as high as 75 bushels. To-day Banner and Victory oats have reached yields up to and over 100 bushels per acre; on a quarter-acre plot of Victory oats I secured a yield of 130 bushels per acre.

In the case of two-rowed barley 40 to 50 bushels used to be considered a high yield, but this has been exceeded up to a yield of 73 bushels, with the Canadian Thorpe in 1915. I have grown this sort for the past 25 years and have kept it up by selection during some years.

In the time of the Romans something was known of seed selection. They knew that by saving each season the largest and best heads they could maintain their highest yields.

In the wheat-growing areas of the American continent the average yields are low, as compared with those of European countries. Our yields are low when we consider the adaptability of our soil and climate for growing wheat and the other small grains. While we may improve on our method of tilling the soil we must depend more on seed selection to increase our average yields—seed selection, combined with plant breeding, producing new varieties by artificial crossing. Individual plants of wheat may carry any number of grains, from 100 to 300; individual heads from 40 to 65 or more grains. Taking the individual plants growing in the field, one could fairly estimate them at 100 grains per plant. If every grain that was sown in the ground grew into a plant yielding 100 grains per plant it would be reasonable to expect over 100 bushels per acre. We usually expect at least 20 to 25 bushels per acre; but as an average for the West we get less than this.

Causes of Low Average Yields.

The reason is not far to seek. There is something wrong with our methods of grain growing. All the seed put in the ground does not reproduce. The seed is partly at fault. If all germinate, the weaker plants are crowded

out by the more vigorous. The grain drills we use are partly to blame, but probably the most blame may be put upon the seed so commonly used, seed of mixed strains or races. The variety may be fairly true, but there is a difference in the character of the grains; some have the ability to produce more seed than others. By a form of selection we may isolate those that are of high character, stool freely, mature uniformly and early, with growth of an even height, more heads per plant, better filled heads, heads that contain uniform grain of a uniform size. By selecting these types and eliminating the inferior types we can expect to increase present yields, and this can be done only by cross-breeding improved types and a close form of plant selection, combined with better methods of tillage.

In the millions of acres now growing grain there are here and there many of these superior types or strains, each of which, if isolated and propagated, will reproduce like characters. Like begets like. It requires considerable skill to recognize these improved forms, which, while apparently the same to the casual observer, have distinct characteristics that the neighboring plants may not possess.

The O.A.C. 21 barley was one selection out of thousands of similar types from one variety after repeated tests and trials in small seed plots. It proved its ability to raise the average yield in Ontario seven and a half bushels per acre.

How Marquis Wheat was Originated

Marquis wheat was growing side by side with thousands of other similar types; but one plant was found by selection to be of high character. From a single plant

it multiplied and multiplied until to-day it is the leading variety, and practically all this wheat grown to-day originated from a single plant. When first sent out into the world from the nursery plot it had to compete with the famous Red Fife. In the first season, an unfavorable one, it gave a yield of 32 bushels against Red Fife's 12. In five years' tests it showed a yield of 42 bushels against Red Fife's 28 at the Indian Head Experimental Farm.

Fig. 41.—Seager Wheeler Amongst His Head Row Plots.

In further trials it went on and on, 50 to 81 bushels per acre. Its reputation was fairly established.

Will it be beaten by some other variety? Who knows! In all probability it will. One thing it lacks that Red Fife possesses—vigor. Sown on stubble, it makes a poorer showing than Red Fife. In the southern, drier districts Red Fife proves more satisfactory; but it is not a perfect wheat in every respect.

Marquis is the result of crossing two varieties artificially; but sometimes natural crossing takes place and new forms may appear in the crops and are looked upon as variations of the types or mixtures of other varieties. Wheat, oats and barley are self-fertilizing plants. It is generally understood that it is not possible for varieties to mix. This is true to a large extent; if it were not so, we could not grow several varieties side by side.

But there are instances where natural crossing has taken place, although it is very rare. How this is done one cannot accurately determine, but one can make a guess. To effect a crossing between varieties wheats must come in bloom at the same time. The pollen from the flower of one wheat must reach the pistil of the other. The pollen of the one wheat must be ripe and the pistil of the other in a receptive condition at the same time. How this natural crossing is done cannot be determined; but some of the following factors may be responsible—high temperature, dry atmospheres and hot winds during the pollination period, causing the glumes or chaff to open. A slight hailstorm may be an agency, the hailstones striking the head and loosening the chaff. A passing bird may strip the chaff. If sown very closely together, high winds may cause the two wheats to meet and the heads may rupture and crossing take place; but as the two varieties must be both in the pollination stage and an accident to the head of each take place at the same time, there is only one chance in a million that this can happen. Nevertheless, isolated instances are known where crossing has taken place.

Reb Bobs wheat is the result of one of these natural crosses. What can happen to it can also happen at some other place, and there are from time to time new forms

appearing in the crops; but because they are not noticed they are lost sometimes forever when the field is harvested and threshed and turned over to the miller.

If found growing in the crops and the plant is taken up when ripe and the heads kept for planting in rows, they may be found to be of some value or they may prove worthless. If they are the result of natural crossing of varieties they will break up in the second season into other forms, one lot resembling one parent and the other lot the other parent. This progeny is known as hybrids.

The Appearance of "Sports"

Another form may appear in the grain crops that is new and distinct, and will not break up when sown separately. It is a new and distinct type or variety. According to Professor Hugo de Vries, a well-known plant breeder, these are known as mutants, or, as commonly called, "sports." They may be new forms that spring suddenly into existence, and I am inclined to this belief. Kitchener wheat was found in a field of Marquis, pure and true. This was the only plant that was not the true Marquis; it was a distinct new form. Had this been a natural cross it would have broken up into other types; but it did not do so. It has remained very constant and is one of the truest and most constant wheats I know of.

In my work of selection in the field in 1909 I found a plant in a field of Bobs Wheat that was green when the Bobs was ready to harvest and the grain in the heads of this plant was only just commencing to fill nicely. Although so green, the plant was pulled by the roots and when dry the grain was very much shriveled. Nevertheless, I wanted to know what it was. The heads were

entirely different to anything grown in Western Canada. The seed was saved and sown in a single row, and, as happened to David Fife when he discovered Red Fife, the whole row proved to be so late that it could be called a winter wheat. Only one plant sent up heads; the rest never got past the leaf stage.

This one plant had the same kind of head as the seed came from, resembling closely the English Squarehead

Fig. 42.—Harvesting Head Row Plots.

wheat. The seed from these heads was sown the following season and the result was a mixture of types—60 or more tall and short growers, white wheat and red wheat, brown and white chaff, awnless and some with slight awns. These were sorted out and have been growing until the season of 1917. Some of these wheats that ripened a crop as a spring wheat crop, when seeded again

the same fall grew as a winter wheat and ripened heads late in July. Other seed sown again in the spring ripened seed that season. Some of them could be grown as a spring or a winter wheat, while all would ripen as a spring wheat. These wheats I gave the name of Winter Spring. They had no value as a hard, high-milling wheat as far as I could determine.

Now, the question is: Where did this plant spring from? How did it appear on my farm where no such wheat is growing on this side of the Atlantic?

I am not yet decided if this wheat is of any value. Unfortunately, a hailstorm in July, 1916, destroyed my crops. The only heads left standing were one or two of these wheats, sown the previous fall and nearly ripe. It may have some value as a spring wheat to be sown again in the fall after taking off a crop, and ripen another crop in late July; but it needs constant experimenting to determine its value.

I might fill pages, telling of the different varieties that I have found by selection on my own farm. An awnless Marquis was selected in 1915—early strains of Marquis that ripen a week earlier; but the grain is not as good as the original Marquis.

Winter Wheat Experiment

In 1908 Professor Bracken, of the University of Saskatchewan, sent me some Turkey Red wheat for trial, also some red clover, timothy and alfalfa. These lots were sown side by side. The winter wheat killed, excepting one or two plants. Some alfalfa seed was sown on this plot and was cut, and cut twice each season until the fall of 1912, when, owing to heavy rains, the alfalfa was not cut.

Noticing some wheat plants growing, I found they were the Turkey Red variety. I allowed them to ripen and pulled the plants and seeded them down that fall. One of these plants was a bald variety, whereas Turkey Red is bearded. This bald form the next season (1913) broke up, throwing out some bearded forms. Selection has been carried on since that time and now I have what I think is a fine line of the bald form.

The question is: How did these plants survive all that time—four years? They were growing on alfalfa plots that were cut twice each season, and then, because the alfalfa was not cut in 1912, the plants came into head. Where did the bald form come from? While they are not entirely hardy for our district, always some seed is produced, and in time a hardy strain may be had by this form of selection. There are some things that happen in Nature that cannot be explained.

I have touched lightly in a general way on the big possibilities of field selection of new types and forms. Before they can be found worthy of a place in agriculture some further selection of these new forms must take place. One cannot determine in a season their true value. With some experience one can decide if they are worthy of further trial at the time they are found, reaching a conclusion by the general character of the plant, the length or strength of straw, its yielding capabilities, the length and size of the heads, the color and shape of the grains. If they do not show any marked ability to rank with existing good varieties, there is nothing gained by further trial.

Whether we want to make a test of any new sorts or those found in the fields or improvements of existing varieties we must do some selection, taking the individual

as a starting point, or the head from an individual plant, and sowing the grains from the single head in a single plot separate from other selections; these plots may be in a single row or in a block. When grown in a single row it is called a "head row" or "head to the row." When sown in a block or square it may be known as a centgener plot.

The Centgener Plot

A centgener plot is of a certain size. One hundred grains are planted about four inches apart each way. Between the plots the same or another variety is grown, but this is cut out before it ripens. This is done so that there will be no vacant space between the plots; if there were, the outside rows would show plants of greater vigor because of the excess of moisture they would draw from the soil over those on the inside of the plot.

These trials are carried on the next season by sowing each centgener in a separate plot. It is to be understood that the centgener—the hundred grains—are from a single plant.

The Head-to-the-row System.

But the head-to-the-row system is better adapted to the conditions of the average grain grower, who cannot afford to carry on experiments by the centgener method. By experience one can determine fairly well by the head row method any superiority of one plant over another. Even the head row method of selection can only be confined to the few experimentors, as the head rows must be seeded by hand at a busy time in the spring, and one must possess considerable interest and have a good stock of patience; it may take some years before any good results are obtained.

There is always a danger of being misled by appearances only; it is not always the plant with the largest head that is the most productive. Heads that may be 6 to 7 inches long may contain less grains than those from smaller heads of say 5 inches. Some plants carry heads that contain a few large grains and several small grains, while others may contain all uniform grains with

Fig. 43.—Threshing Seed from Head Row Plots.

very few small grains. Thickness of stand may be indicative of productivity. Some plants may grow heads of a uniform height, while others may show a range of different lengths.

These are a few of the characteristics to watch for. Even after some years of repeated trials of individual plants that have several good characteristics, one may find that they fail in some important particular, such as

yield or milling quality. I have had to discard thousands of types that at first were promising because they did not stand up to the test. I have discarded a great number of new strains that I originated by selection and that in point of yield would outyield any of those wheats we now grow; but they failed because they were low in milling value. One must be prepared to show no favor to any sort if it fails on some important point, no matter how good it may be otherwise.

Some of the different grains that have been under selection in head rows or very small plots, and have been grown for the last six or seven seasons, have never yet got past the head row, but are still confined there for further trial. One cannot expect to base judgment on a single season, as one is altogether likely to fail the next season. Selection of the Red Bobs and Kitchener wheats, made several years ago, are only this season (1918) being put out on small seed plots, while they are also kept to the head row plot. It takes a long time to determine the true value of any selection, and one must consider himself fortunate if he makes any improvement over existing varieties in many years of repeated trials.

After carrying on for some years the work of improving Preston wheat until I had reached the stage where it was a decided improvement over the original first lot, I was compelled to drop it, as Marquis, Kitchener and Red Bobs meanwhile had proved to be better wheats.

When the selection of a single plant is made, and after repeated trials and tests it proves true and constant and does not change by breaking up into other forms or types, then the progeny of such a plant is known as a pure line or pure race. Once this is established, little is to be gained by further selection. No advancement can be

effected, excepting to maintain the purity by mass selection.

Some authorities claim that no improvement can be effected by mass selection of any variety beyond maintenance of the purity. Amongst mixed races or strains it is possible to do valuable work, because amongst these mixtures (by mixtures I do not mean mixture of varieties) there may be some strains of high value; if these were eliminated by the selection of one strain only, the balance being discarded, they would be lost for all time.

Operating the Head Row Plot

The selections sown in the head row plot are those selected the previous season. They may come from head row plots of the past season or from the mass selection plot or from the field. Each head represents one individual plant. The grains are separated from the head and placed in small envelopes, the character noted and taken down. There may be one or any number from a given variety, or it may be only one single plant of a new type found in the field or plot.

There may be selection from more than one variety of grain. In the case of wheat all the different lots are seeded in a single day if possible. The date of seeding, the time of heading out and the character are noted during the growing period; also the time when ripe and when harvested. A suitable piece of ground is made ready for the head row plots the previous season. This is very important. The plot should never follow a grain crop; some other cultivated crop should be grown after a grain crop. If this is not done, there is a possibility of volunteer grain of other sorts appearing among the

head row plots. It is not wise to use even the summer fallow. The plot is made uniform.

When ready to sow the plots a drill is opened up with a hoe or similar implement and the seed is dropped at equal distances apart in the row, or nearly so. The soil is then filled in over the seed and raked until uniform. A stake, indicating the selection, is placed at the end of each plot. Where there is more than one head selection of the same variety the rows are known by numbers—Row 1, Row 2, and so on. Where there is only one selection it has a stake to indicate it. The rows are made about six or eight inches apart to approach as nearly as possible to field conditions. The seed is dropped about one inch apart in the row to give each plant individual an equal space to develop. In seeding the different varieties the same day one can determine more fairly the difference in the period of ripening.

After the wheats are seeded, the oats and then the barleys are sown.

At the time of writing (July 2nd) in my head row plot the earliest strain of Red Bobs wheat is almost in head, while the Marquis and Kitchener are coming into shot blade, all of normal growth. The small plots of Winter wheat are in head, with the promise of a full crop of normal length of stem. I refer to this as these spring wheat plots were seeded on May 8th. In 1917 Red Bobs and Marquis, sown on May 3rd, showed the Red Bobs with some heads fully out on June 28th, while Marquis was nearly two weeks later reaching the same stage.

Provide Field Conditions

The rows in the head row plots should always be planted as near as possible to field conditions; if sown in rows

too wide apart it will encourage coarse growth, more stems per plant, larger heads, but not always larger or better grain; rather otherwise, as under our conditions the shortness of the growing season is the limiting factor, and growth may be continued so long as to endanger

Fig. 44.—Passing Grain from One Pan to Another. The Wind Blows out the Chaff.

the crop to frost before it is ripe. If growth is continued and the crop is not frozen, rust will seriously injure it. We have evidence of rust almost every season, and it will affect late crops.

The grain does not always develop plump and sound in the large heads. There is no advantage in having the plants too far apart when one seeks a true estimate of their worth. Heavy stooling plants with large heads are an exaggeration, and there can be no true estimation

of their real value; for when sown under field conditions the heads will be only of normal size. But when tested under average conditions and equal opportunities, if one row—and the row represents one plant—shows that plant, heads and grain are of more vigorous growth and habit, then one is better able to determine its fair value. When one plant shows any distinct superiority then it can be isolated, and the following season be tried out in both the head row and separate plot—this only when the plant is a pure line or race.

I have found that the Marquis is inclined to break up to some extent into other forms. When a plant does this the whole row is discarded. I have, however, a pure line selection. made in 1912, that has not broken up since and I am still growing this strain in head row plots and a somewhat larger plot this season. Unfortunately, just as one begins to get a strain put out in larger increase plots a hailstorm may come along, as was the case in 1913 and again in 1916, and destroy it. The increase is not rapid under these circumstances.

I might refer here to some strains of Marquis that I have been growing since first selected in 1911 and 1912. They are known by numbers—No. 3, 5, 6, 10. B-570-1260, etc. Many others that may be classed as variations have been discarded. No. 3 had a soft chaff that allowed shattering of the grain when ripe; this one is discarded. No. 5 is an early strain, and in the hope of securing an early strain it has been kept under selection. This one has a distinct character, the shape of the head being very compact, but filling well, with stiff straw and erect head; the quality of the grain is only fair, however, and as it does not fill out smoothly in every season I have discontinued growing it this season. No. 6 is a remarkably erect, tall

grower, but is not equal to the original Marquis. No. 10B is one of the best constant true strains and is being propagated. No. 570 is another early strain with large, long head, of true Marquis type, but the straw is weaker than it should be, and this one is being discarded. 1260 is another good strain, similar to 10B.

There are some other good selections, but these are still confined to the head row plots. An awnless strain has been under selection since 1916, but so far has not ripened as early as the original Marquis. 10B and one other so far promise good results, but do not ripen any earlier than the original Marquis. There is no special value in any pure race unless it possesses high qualities.

Keep the Strain Pure

While the head row plots are growing, watch is kept to see if any break-up or any strange types get in. These are pulled out by the root, if found. If any rows show any superiority, or apparently so, the fact is noted and a record kept the following season as well. Sometimes this apparent superiority is due to external influences and not to the plant itself. If it shows the same character the following season and the next, then one can consider it as a fixed characteristic of that individual plant.

When the plots are ripe, selections are made of individual plants in the row, either by pulling up the whole plant or simply taking one or more heads. These are tied and labelled if the plot be uniform and true to type. The whole row or plot is harvested, cutting by hand with a sharp knife and taking the whole straw or cutting about a foot below the head. In some instances, where the rows are true to type, once enough head selec-

tions have been made for next year's head row plots the best heads that remain are selected to grow in a seed plot the following season.

There is a purpose in doing this. These plots, while apparently similar, may be of a separate strain, and, if discarded in any one season, there may be one or more amongst them that is really an improved type or strain; these would be lost unless they are saved, massed together and sown on a separate plot the following season, in which case they may be detected and isolated and given another place in the head row plot.

The head row plot is the place where every plant or head selection is put on trial. Such selection, growing in the field of mixed races, is just one of the crowd. When discovered, a name or number is given it and it is placed away with others until the time comes to put it in the head row plot. The head row plot is the melting pot, so to speak, and according to the plant's ability it is either cast out as dross or proved to be good metal. If there is any doubt it is given the benefit, being carried over to another season to take its place in the head row plot; it may be found worthy of continued trial with the best sorts or go to the hand-selected seed plot to be multiplied for general propagation.

Selections may be confined to the head row plots for five or ten years, and if one makes good—proving to be true and constant; showing no variation of type—it is given the honor of a separate small plot where its progeny is increased and it goes forth as the descendant of a pure line or race. The standard of excellence must be high and only those that come to or near that standard are selected for further trial. Consequently, the number is small; but always there are some that are selected

each season, and these go on probation when a likely type is found. It may be a new form or a good type of existing varieties, its value only apparent to the eye. To determine its real value it is placed in the head row with other similar selections and the first season of growing in the plot, side by side with well-known good types, it will have an opportunity of making good, its characteristics being fairly well determined in comparison with others growing under equal conditions.

Earliness of Maturity Essential

Any sort that does not mature reasonably early is of no value under our conditions. One of the most important points to determine is its milling qualities. If the standard is low, no matter how good it is in other respects, it must go into the discard, as it will only be a loss of time and labor to give it a place in the head row. High yield is another point to ascertain; one can determine this only after repeated trial. Its ability to yield is apparent only while growing in the plot, but if this be apparent each season one can get a fairly accurate estimate of its possibilities. Essential characteristics are length and strength of straw, size and shape or type of head, and there are some minor points.

In the tests there is a lot of weeding out of undesirable types. The best types are confined to the few. In the course of selection even the best of one season may have to give place to others that may prove superior. When the plots are ripe, selection of single heads or single plants from the individual head row is made from these rows that are worthy of further trial. These are labelled. Selection is then made from the balance of the row for the hand-selected seed plot. Those that are

not wanted or those that are not worth further trial are left standing; later they are mowed down, raked and carried off the plot.

Each head selection is kept separate or there may be more than one from an individual row. These grains are separated from the head by hand and the grains from

Fig. 45.—Screening Out Chaff and Broken Heads.

each head kept separate by placing in small envelopes until ready to sow again. In separating the grains from the head the number of grains, the size, shape and color are noted, and here there may be some more weeding out of undesirables.

Some of the winter wheat selections are confined to the head rows and small plots. Here they go through a more rigorous selection than the spring wheat—selection

by hand and selection by nature. Some may die through winter killing; some always survive. This is good testing for hardiness. In time—and it will take many years —one will be able to evolve a hardy type, suitable to our conditions. I have had some of these growing for nine seasons, and they are still confined to the small head row plots and a slightly larger increase plot. In this case nature makes sure selection, saving considerable time and labor. This is the only way to secure a hardy winter wheat. It may take 20 years to do so; but it will be worth the trouble taken.

When we can grow in the Prairie Provinces a sure crop of winter wheat we will go a long way towards solving some of our problems—such as the wild oat, drifting soils, fall frosts and rust. It will spread our work more evenly over the season and will allow of more time in the spring to put in the spring wheat crop and put it in better. Whether we can evolve such a type of winter wheat only time can show.

I have stated that there are some happenings in Nature that cannot be explained. Let me illustrate. In the fall of 1912 Mr. F. McClure Sclanders, then commissioner of the Board of Trade at Saskatoon, sent me a small parcel of Kharkov winter wheat. Mr. Sclanders was interested in agriculture and was always willing to help me to carry on experiments. As he says: "It is not what crop can we grow; but what crops can we not grow?" Some years ago he sent me some Soy beans that he secured direct from Manchuria at his own expense. I managed to ripen a few seeds, and these, planted the next season, were dstroyed by hail. He also interested me in growing clovers; some of the red clover he secured

for me is still being grown on my farm, and probably a hardy strain may be evolved.

To get back to this Kharkov winter wheat, it was hailed out at the time it was ripening. This was in the summer of 1913. The land it was grown on was plowed up early that fall and potatoes grown there the following season. The next season some of the red clover was grown there, and in 1916 this crop, which stood four feet, was smashed down by hail. It was plowed up that fall and peas sown the next season (1917). In 1918 potatoes were to be planted on this land. Just previous to plowing for the potato crop I noticed one plant of winter wheat, well advanced. I dug it up and planted it elsewhere, and at this time (July 2, 1918) it is fully headed —a fine plant and the Kharkov variety.

The question is: "How did this wheat show up after five or six years with the plowing up of the land and the different crops since grown?" No doubt it was started in the pea crop and not noticed; then this crop was cut with a scythe. The seed of this survivor will be saved for a place in the head row plot next season. Whether it will prove hardy time will determine. Discovery of new varieties is all a matter of selection of seed—selection by Nature, assisted by Man.

CHAPTER XVII

Seed Plots and Their Preparation

By the term "seed plot" is meant the place where hand-selected seed, obtained by mass selection, is to be grown for the purpose either of making further hand-selections by mass selection or for multiplying seed for future use.

Naturally where seed is selected by hand and made ready for sowing, it is very necessary that a specially prepared plot should be the place to seed and multiply it. It is essential to have the plot properly fitted to grow this seed—to have it free from weeds and volunteer grain of other varieties. It should never be on stubble-plowed lands.

My experience in laying down seed plots for different kinds of grain is that the best place is where some cultivated crop had been grown the previous season, particularly a potato crop. When this is not possible, then clean summer fallow should be utilized. But to get the best results one must plan a year or two ahead as to the location of the plot and the kind of crop to be previously grown. With the beginner, who is laying down a seed plot for the first time, clean fallow land would be best choice. He can plan ahead for future plots.

I do not suggest laying dowu a seed plot on potato land simply because potatoes were grown, but because I know

that that particular place will be made clean and free of weeds, etc., by the cultivation given for potatoes. After any similar crop would answer just as well, but one advantage is that the potato crop is planted in rows wide apart and cultivated, and this crop is not using up

Fig. 46.—Multiplying Field of Wheat in Stook.

the moisture the same as some other crops which are planted more closely.

In planning to sow after a potato crop, and where the previous crop was grain, cultivation of the stubble should be given in the fall. Plow deeply at the time the potatoes are planted. Even this will not guarantee elimination of the grain, as sometimes heads of grain, buried in the spring on land planted to potatoes, lie in the soil throughout the season and may show up in the seed

plot. The plot is then full of "rogues," or foreign grain. Therefore, it is best to plant the potato crop on good summer fallow and cultivate throughout the growing season to keep down weeds. This makes an ideal place for a seed plot.

Another reason why I prefer the seed plot after the potato crop is that in planting the crop the plowing is made deep—anything from eight to ten inches deep—and this is some guarantee that the seed plot will be a success.

If such a preparation is not made, then have good summer fallow land. Where a corn crop has been kept clean by cultivation is another suitable place to have a seed plot, or any place where a cultivated crop has been kept clean and free of weeds.

In planning ahead the location of the plot and the kind of crop to be previously grown, plow it as deep as possible before planting the crop, whether corn, roots or potatoes. Plant in rows as wide apart as is advisable; or plan a deep, well-worked summer fallow. When the potato crop is harvested, clean up the dead vines, then disc it, not too deeply. Harrow it, and when the surface is dry, plank-drag the field and make it uniform and level. When this is done, if a spring-tooth cultivator is available, run it over the field to corrugate it. (See Chapter VIII—Conserving Soil Fertility—Page 113). Leave it in this condition until the spring. When no cultivator is on hand, the disc harrow should be run lightly over the surface to do the work; but the land should not be disked too deep. If it is ridged about two inches deep that will be sufficient.

In treating corn land the operation is repeated, except for the plank dragging; the stalks of corn in the

rows will not allow of the land to be dragged properly.

If summer fallow is intended for a seed plot, then corrugate it at the end of the season.

Any garden land kept clean by cultivation will answer, if it is large enough, to use for a seed plot.

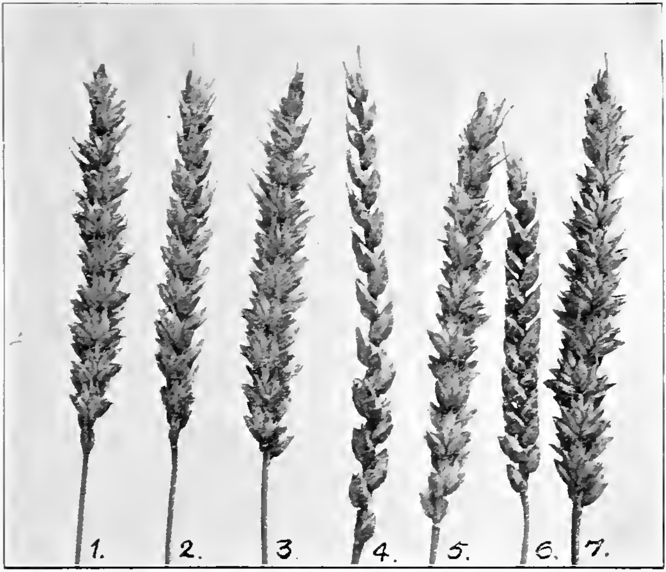


Fig. 47.—Types of Marquis Wheat Isolated by Selection. Nos. 1, 2 and 3, average Marquis types; Nos. 4 and 5, loose open types to avoid; Nos. 6 and 7, close, compact types.

Size of the Plot

The size of the plot will be regulated by the amount of grain to be seeded. One-quarter of an acre is a very convenient size, neither too small nor too large. I have been referring so far to hand-selected seed plots, where

the seed that was previously hand-selected is to be sown. It follows that the amount of seed will not be large in this case; where seed is bought for multiplying, the plot may be larger in size. For the purpose of hand-selection of seed to be carried on from time to time, entailing some labor and care at a very busy time in selecting the head from a seed plot—under such circumstances this size of plot (one-quarter of an acre) will be found convenient. I have had seed plots of all different sizes where from one pound up to 50 pounds were sown, and I find this size the most practicable.

The Shape of the Plot

The plot may be made long or square. I find that the long plot is most convenient, anywhere from 100 to 120 yards long. The width is regulated by the width of the seed drill; one can figure out how many rounds of the drill can be made to complete seeding the plot without running out of the seed or too much left in the seeder unsown. The plot should be sown so that it is finished evenly.

In laying down the plots some space must be left between if other grain crops are seeded alongside. If only one plot is laid down, and this is done alongside other grain fields, sufficient space should be allowed between for the team and binder to cut the plot without trampling the other grain.

Where more than one plot is laid down—as would be the case for wheat, oats and barley—then space must be left between each plot, not less than six feet, to prevent any leaning of grain from one plot to the other. In harvesting there is otherwise some possibility of getting mixed. In laying down more than one plot, the grain

that is expected to ripen first should be sown on the outside, the next earliest following so that the outside plot can be first cut by cutting one way. When this first plot is cut and out of the way the next is finished, and so on until all the plots are harvested.

Each kind of grain should be set up in stook on its own stubble. This is essential. If set on the wrong plot,

Fig. 48.—Threshing Plots of Selected Grain.

stray heads of the other kinds may get in the butts of the sheaves. Everything should be done to maintain the purity, and it takes practically no more time to do it right than it does to do it wrong. A season's work in carefully hand-selecting seed grain may be spoiled by an oversight.

When the plots are ready to harvest, hand selection of the heads should be done, previous to cutting. If time is pressing, then the better parts of the plot ought to be noted during the growing period and the sheaves from

that part of the plot set aside, selection being made from these sheaves. The best work is done while the crop is standing, of course. The selection of heads is described in Chapter XV on mass selection of seed grain.

The Location of the Plot

Where possible, the plots should be situated near the house so that they can be investigated conveniently from time to time. If too far away from close supervision, stock or gophers may injure the crop before it can be prevented. Watch for gophers. They will soon cut down a small plot if they are numerous. If cut-worms work in the plot in the early stages they may be met by sowing bran, treated with Paris green, broadcast on the plots.

The seeding of the plot may be done as outlined for the summer fallow. It will be advisable to harrow the plots just as the grain is beginning to show through the ground, even if there are no weeds. The cultivation thus given will maintain a mulch and encourage growth.

When more than one kind of grain is grown in seed plots it is very advisable not to seed grain the following season. The plots should be planted to a cultivated crop or summer-fallowed to eliminate volunteer grain.

CHAPTER XVIII

Why Every Farmer Should have a Seed Plot

In the foregoing chapters on "Improving Crops by Seed Selection" and "Seed Plots", I have pointed out some of the advantages whereby the common standard of grains as now grown may be materially improved, both in yield and quality. It is a noticeable fact that there are only a few growers who are producing registered or pedigreed stock. Apparently, the work is confined to those who have developed a special interest in this line of work, while the big majority are not inclined to devote their time and energies to follow out in detail the rules and regulations of the Canadian Seed Growers' Association. The chief drawbacks appear to be the amount of work to be followed out in detail, and lack of time and help, particularly at harvest time. Many growers who have started out somewhat enthusiastically have soon dropped out, feeling that the regulations of the C. S. G. A. were too stringent. Before a grower could become a member of the C. S. G. A. he was required to operate a hand-selected seed plot and select by hand heads of grain sufficient to sow a small seed plot the following season, usually about one-quarter of an acre, and make selections by hand therefrom from season to season. When this was repeated up to the third season, provid-

ing the work was up to the standard, the grower could have the progeny of the hand selection registered as "Elite Stock Seed." Thus ordinarily it took three years before the seed could be registered.

Elite Stock Seed sown and multiplied on a larger field the following season was recognized as first generation registered seed; this seed multiplied the following season as second generation seed, and so on down to the third generation, after which it passed out of the registered class. Thus to keep up the standard of registered seed, the grower was required to maintain a small seed plot each season.

A producer of registered seed had to be a member of the Canadian Seed Growers' Association. These restrictions resulted in curtailing the quantity of registered seed available to the trade each season. In the whole of Canada, from coast to coast, there were, in September, 1918, a total of 393 members in full standing, and 1,018 applicants for membership, making a total of 1,411 affiliated with the Association. This is a small number, considering the number of years since the C. S. G. A. was first started. Apparently it is owing to the high standard reqnired for registered seed that has been so far maintained, and adhered to, by the Association that there were so few producers of registered seed.

The report of the board of directors and of the secretary of the C. S. G. A. in 1918 showed that, despite war conditions, substantial progress has been made. This report indicated a greater appreciation of the value of systematic seed selection and propagation on the part of the average farmer. A number of very gratifying letters from purchasers of registered seed was presented. At this meeting an important change was made in the

regulations regarding the registration of seed under the rule of the Canadian Seed Growers' Association.

New Regulations of the C. S. G. A.

These regulations as amended permit any grower, whether a member of the Association or not, to purchase Elite Stock Seed, first generation registered or second generation registered seed, and have the immediate progeny registered. The progeny of third generation seed cannot be registered as it has passed out of the registered class. The requirements still stand that before the seed can be registered the crop must be inspected in the field, and the cleaned seed also inspected, after which the grain, if found satisfactory, may be registered and sold as such.

This change in the regulations of the C. S. G. A. should have a far-reaching effect. It should stimulate a greater interest among grain growers in the betterment of seed, and encourage growers to grow more registered seed. It provides an opportunity that none should miss to increase their yields and grow registered seed to meet the ever increasing demand. It cuts away the detail work of hand selection, and laying down of small seed plots from which selections had to be made. This work may be left to those who are members of the Association and are interested in the production of Elite Stock Seed and Registered Seed for non-members to multiply.

The regulations as amended allow any grower to simply purchase at first hand some Elite Stock Seed, first or second generation registered seed, grow it and have the progeny registered in its proper class. In sowing such seed care should be taken that the seeder is clean and free from any foreign grains. It must be sown on clean

land where there is no possibility of other grains becoming mixed in the crop. In harvesting, have the binder cleaned of any foreign grain, and in threshing have the machine cleaned out to eliminate other grain. If there is any doubt keep the first few bushels that come from the machine apart from the rest. Store in clean

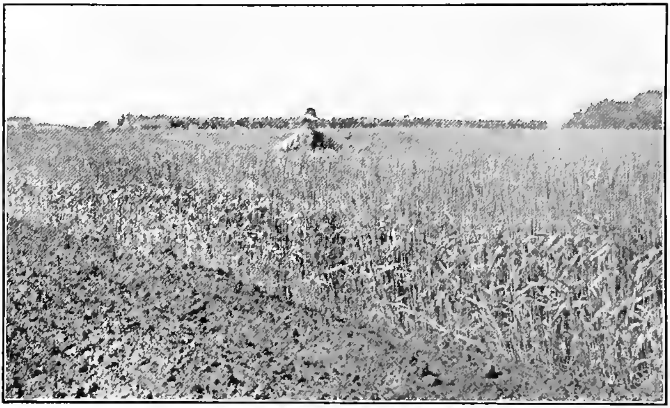


Fig. 49.—Multiplying Field of Marquis Wheat. Yield, 40 Bushels per Acre.

bins, and in cleaning the seed see that the fanning mill and sieves are clean.

It is probable that co-operative seed societies may be formed in the West, with warehouses equipped with cleaning and grading machinery, and to which registered seed may be sent direct to be cleaned or recleaned. It may then, at the grower's option, be returned or sold as his own particular seed. He will also have the option of cleaning and selling the seed himself.

Where a grower has some portion of the farm in clean fallow, a good plan would be to set apart one or more acres for sowing to registered seed.

Secure the Best Seed Obtainable

Great opportunity comes to the grower who will lay down a seed plot of an acre or two and devote it to growing the best strain of registered seed to supply the demand for registered seed from the grower of larger areas. Naturally, the best seed to buy would be first generation seed of as good a stock as is possible to obtain, as from this time forward there is bound to be a greater demand for better seed. From my experience in growing registered seed, I would suggest an acre or two acres as large enough to use as a seed plot, as these smaller areas are more easily rogued and the purity maintained than are the larger areas.

Elite Stock Seed is the highest pedigreed seed obtainable, but it can be obtained in only small quantities, for obvious reasons. As this seed is the progeny of hand-selected heads, and usually grown on small plots of one-quarter of an acre, the yield from each plot may average anywhere up to 10 to 12 bushels, according to the yield. It is not in the interest of the producer of this Elite Stock Seed to sell it, as it can be multiplied into first generation registered seed. The amount of Elite Stock Seed produced each season restricts the area that will produce first generation registered seed. A few acres only, averaging around five acres, can be sown with Elite Stock Seed from a quarter-acre plot. This will multiply into anywhere from 100 to 200 bushels of first generation seed. It is to the interest of the producer to hold all his Elite Stock Seed for propagation before he disposes of

any for sale. In some cases there may be a few small parcels of Elite Stock Seed which may be purchased by growers who are interested in seed selection, such as members of the C. S. G. A., or beginners who want to start out with genuine foundation stock.

Opportunity for Seed Growers

Grain growers should be alive to the big possibilities of growing an acre plot of first generation registered seed.

Fig. 50.—Multiplying Field of Victory Oats.

The first outlay is trifling compared with the return. For example, let us say that one buys registered seed at double, or even treble, the market price for ordinary grain. Marketed grain at present prices averages around $2.00 per bushel. Ninety pounds, sufficient for a one-acre plot, would cost $3.00. Registered seed at double the price, $6.00, or at treble the price, $9.00, sown on good, clean, fallow land, putting the yield at 30 bushels per acre, would yield 30 bushels. This amount of ordinary seed sold in the market would be worth $60. Sold

as registered seed at say $3.00 per bushel, and it ought to sell at a higher price, the price realized would be $90, a gain of $30 per acre. For some little extra care in seeing that the crop is kept pure and in cleaning the grain for seed purposes we might allow $5.00, leaving a clear profit of $25 per acre.

According to the cleaning process, whether it was graded heavily, an extra charge can be added to the $3.00 per bushel. In the majority of cases the seed will be worth more than $3.00 per bushel. Where the yield is higher than 30 bushels per acre, which is a reasonable thing to expect, the profits are increased accordingly, and at 50 bushels per acre the crop will be worth $150 sold as registered seed, against $100 as market grain. The outlay for handling stands the same, regardless of the yield. It costs no more to grow and harvest registered seed than it does ordinary seed.

There must be some reservation in quoting yields that may be expected. I have placed the figures at 30 bushels per acre only as an example. This may be increased or decreased, depending largely on the cultivation, and the conditions under which the crop is grown. Should the crop be a partial or total failure the cause cannot be laid to the registered seed any more than to ordinary seed.

It is not necessary that large quantities of registered seed be purchased for foundation stock. This can be left to the option of the grower, but sufficient seed for one or two acres is within the reach of every grower, and if every grower could realize and grasp the possibilities that lie in growing registered seed we would soon see the day of scrub seed pass and materially increase the profits in grain growing. For a great many years there will be no danger of over production of registered seed. When

that time comes, if ever, there will be men who will still devote their energies in the production of higher and more profitable strains and there will ever be a demand for better seed.

In the past when high prices were paid for registered seed the purchaser who grew it could expect some return in increased yields and better quality, selling the surplus

Fig. 51.—Multiplying Field of Victory Oats in Stook.

only as the progeny of registered seed. As it now stands he can dispose of any surplus as registered seed at a higher price, and consequently to his material advantage.

Benefit by the Work of Others

From my own experience in the past as a producer of registered seed I have arrived at the conclusion that the grower who purchased registered seed at a high price, and simply multiplied it and maintained the purity, reaped more benefit than the original producer, who spends his time and labor and energy in the work of seed selection, for the obvious reason that whereas it takes several years to improve any kind of crop by selection the grower who buys this seed has an advantage in simply

multiplying it. He reaps a direct advantage without the original cost of production. This is the position of every grower to-day. He is now able to reap some of the benefits, with but little extra effort.

To put the case in a nutshell, many growers were reluctant to produce their own registered seed, which entailed laying down small parcels of seed on small seed plots, from which hand selections were to be made, maintaining the purity and breeding, threshing of small plots and cleaning of the seed. These were some of the things that deterred many farmers—they simply would not be bothered with the work. All this is now more simplified and he is wise and prudent who knows how to take advantage of growing an acre or two of the best registered seed to supply coming needs.

Growers who desire to become members of the C.S.G.A. may still do so and produce Elite Stock Seed and first generation registered seed to supply non-members of the Association.

CHAPTER XIX

The Fanning Mill

Unless great care is exercised in cleaning and grading grain for seed purposes, all of the seed which is to be sown, the best results cannot be obtained from one season to another, no matter how carefully the seed grain has been hand-selected. A good fanning mill, therefore, is indispensable; without one no farm equipment is complete. It is profitable to use a fanning mill for cleaning up marketable grain before it is sold, both with the view of raising the grade and to separate all the weed seeds and light grain for use as feed. It is not absolutely necessary to use a fanning mill for this purpose, of course, but its use for seed purposes is quite another matter. In fact, it cannot be omitted, and it is safe to say that if used judiciously it will repay for itself in a single season in the betterment of seed grain.

On a great many farms there is no fanning mill. Some farmers depend upon borrowing from their neighbor, a policy which for many reasons is not sound. To do good work with a fanning mill one must have some knowledge of its operation, and this is not possible when one's experience with it is limited to a day or two that it is borrowed; for there are many different makes and styles of fanning mills, differing from each other in one respect

or another. Again, the borrowed mill may not be in good working order, the proper assortment of sieves to do good work may be lacking or they may be damaged or broken in some way. The operation or adjustment may not be understood. To do good work there should be a range in the size of the different sieves for different work—screens suitable for wheat, oats, barley, etc.

The other fellow should not lend his fanning mill, anyway, as it is as particular as a watch almost, and if it is not kept in the same working order that it came from the factory it cannot do its work properly. The sieves are easily damaged, dented or broken; they should receive great care in handling, and if it is the practice to lend the mill away from the farm it is not long before something goes wrong. The proper place for the fanning mill is on the farm where it belongs, and it is just as important as any implement on the place. I would advise every farmer to own a good fanning mill and to take care of it. Lend a plow, a binder, a cultivator or packer if you wish; but hang onto your fanning mill if you want to get the best service from it.

Preparation of Seed

The seed which goes into the ground should be prepared thoroughly beforehand, and the time to do this is during the winter months. Although the grain as it leaves the threshing machine and is put in the bins or granaries may be entirely free from weed seeds, it is, nevertheless, far from being fit for seed purposes as it stands. An average sample from the bin will contain large, plump grain, small, shrunken grain, small, plump grain, large shrunken grain, immature grains and medium-sized grains. Neither in size or weight will the

sample be uniform, no matter how clean of weed seeds and foreign matter it may be. There will also be some chaff, dust, white caps and straw, more or less according to how clean the separation was made at threshing time. Then there is always the possibility that the sample will show weed seeds of different kinds, size and weight, and maybe some other grain.

It requires some experience in the use of the fanning mill or grain cleaner to make a perfect separation of all these different lots. No sample that may be called good seed or used for exhibition purposes can come direct from the field or the threshing machine. No matter how perfect or uniform a field or plot of grain may appear to be at the time of harvesting, there are always some imperfectly filled heads scattered throughout the crop. If any single plant is pulled up by the roots it will be found that the tallest and largest heads are those which come first out of the shot blade; the others may be later stools with smaller heads, probably having imperfectly matured grain in some of these late stools.

In separating the grain from a single head there will be found three sizes of grains. At the base of the head are small grains. As each spikelet nears the centre of the head they increase in size, and so does the grain. From the centre towards the tip the size decreases. These three grades in a single head may be classed as small grains, medium grains and large grains. Again, the strongest and best matured stems or stools are those which first come out into head; naturally these contain heavier and more vigorous seed. Of the three grades the large, plump grain will be found in the minority. If one made a choice of the three lots for seeding purposes, it would fall upon the large, plump seed. Now,

the practical means to make the separation is by judicious use of the fanning mill or grain cleaner or grader, and it is to the interest of every grain grower to do this work.

Do Not Sell Your Best Seed. Use It

For the consideration of a few cents more per bushel would you believe that many farmers sell the best seed, the cream of the grain, to be shipped out of the country, and use the poorest quality for planting? It is a fact! Hold back your best seed for next year's crop. Even if you do not attempt elaborate seed selection, at least separate the largest and plumpest grain by means of the fanning mill, putting back the smaller grain into the bin for marketing.

It is not meant that the undesirable small kernels will not grow. They may even give good returns. But it has been demonstrated fully that the use of large, plump seed gives an increase in yield. It is true that frozen or frosted grains make good seed, and even immature grains will germinate and grow; but to make use of these from season to season means deterioration. It is going backward, instead of forward. Fanning mill selection, combined with seed selection, makes for a decided improvement that is noticeable each season. Good, sound, plump seed will befriend you in an adverse spring by germinating more readily. Remember that in the plant kingdom, as elsewhere, there is a struggle for existence, and the battle is to the strong; the fittest survive. Therefore, take pains to grade up all seed as carefully as possible each season.

Sieves and Wind Blast Both Needed

There are different makes of grain cleaners and graders, and different styles of fanning mills, equipped with

suitable sieves and wind blast; but the general prin ciples in cleaning are the same. Some machines are equipped with sieves, but have no wind blast, but for the best work both are necessary. Preference will attach no doubt to one style or another; but to get the best out

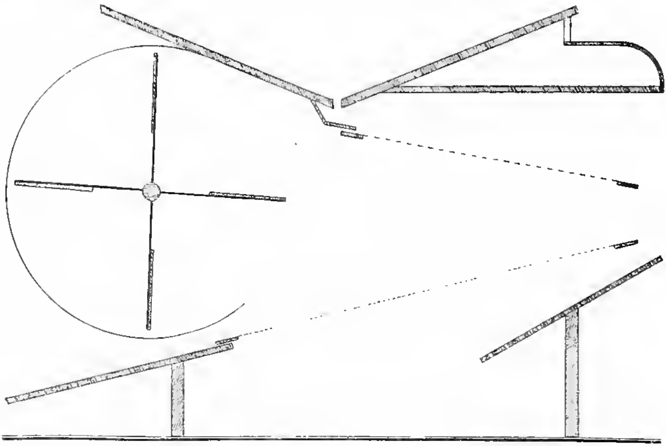


Fig. 52.—Construction of the Ordinary Fanning Mill.

of any mill experience with it is necessary. There are some specially constructed cleaners which are too expensive for the average farmer who has only his own seed grain to clean.

Principles of Construction

The general purpose fanning mill is equipped with a set of sieves in the upper shoe, called the wheat gang, for cleaning wheat. The sieves are arranged to allow the wheat to fall through the perforations onto a conveyor shoe. By this it is carried on to drop onto the screen in the lower shoe. In passing over the wheat gang

the grain falls through the sieve while the larger impurities—straw, straw knobs, chaff, broken heads, white caps, tame oats, wild oats, other grain and impurities larger than the wheat—are carried over the back of the mill. The grain and small weed seeds that drop through the sieve fall in a stream to the lower shoe. The wind blast is arranged to pass through the falling grain and remove the light weed seeds, chaff, dust and lighter grain; not all of these, however, are removed by the blast at first cleaning. Some provision for this is made in the lower shoe, where a suitable screen is placed. This is expected to take out these impurities as the wheat flows down the screen into the bagger. This screen is known as the grader screen, as it removes the smaller grain. Whether the separation will be satisfactory or not depends upon the kind of screen used.

Even here, however, not all the impurities can be removed at the first cleaning, which is but a preliminary operation. After the first cleaning take out the sieves and clean them to get rid of broken grain and bits of straw that may be sticking in the perforations. If the grain contained wild oats, these will be sure to be lodged in the sieves, and must be removed. It is important that at the second or third cleaning the grain should have free passage on the sieves so that any remaining wild oats or impurities will slide or roll smoothly to the back of the mill. For the same reason care should be taken to have the wheat gang clean, smooth and undented. Do not let the sieves sag. Clean the screen in the lower shoe also.

Sizes of Sieves

In addition to the assortment of screens and sieves which equip most fanning mills when sold it is necessary

to have extra sizes. These can be procured from the people who sell the mills. I may list here the sizes necessary for cleaning seed grain. For the wheat gang they are as follows: 9 x 9 wire, 8 x 8 wire, 7 x 7 wire, 2 x 10 wire, 2 x 11 wire, and a buckwheat screen. The latter is made of perforated zinc. The perforations are triangular in shape, the same size and shape as wild buck-

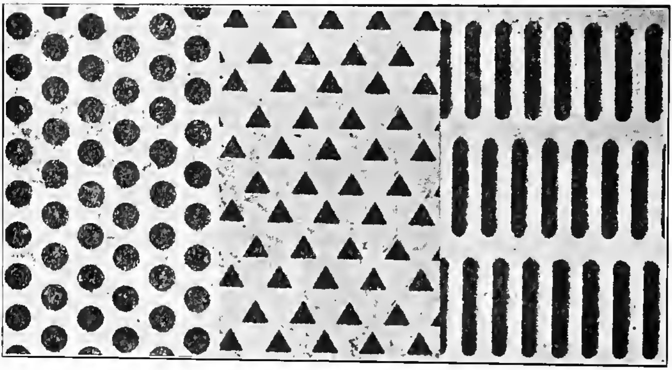


Fig. 53.—Types of Perforated Zinc Sieves.
Left, perforations 8-64-inch; middle, buckwheat screen; right, perforations, ½-inch long and 5-64-inch wide. All exact size.

wheat. This screen is very desirable, as it takes a large-sized screen to remove buckwheat. No wheat will fall through, except small or cracked wheat. If a wire screen is used it is necessary to use the 8 x 8 size, which allows medium-sized wheat to fall through. The 9 x 9 is too small to take out buckwheat. The buckwheat screen I have referred to is 8 x 8, the most useful size for the purpose.

All these sizes, except the 9 x 9, are used in the lower shoe for grader sieves. The 9 x 9 is good for cleaning

grain for market, removing small weed seeds and very small grains; but it is too small to use for cleaning seed wheat unless the wheat is small. For grading seed wheat the 8 x 8 is more useful. The 2 x 10 may be used to take out the small wild oats that got past the wheat gang. The 2 x 11 is slightly smaller still in mesh and the operator must decide which size to use after examining the sample to be cleaned. If the grain is free from wild oats the 8 x 8 would be the best size to use.

Cleaning Oats and Barley

A different set of screens is required for oats and barley. The sieves sent out usually with the mills are coarse, large-sized, made of wire, with a single sieve in the upper shoe. To clean out large straws this is all right; but it won't do for cleaning seed.

I find that the most satisfactory sieve is of perforated zinc. The perforations are larger than those made for wheat—large enough to allow a medium-sized field pea to fall through. The sieves should be the full length of the upper shoe, and one, two or more may be used in a gang. They allow the oats to fall through, the same as the wheat, letting most of the impurities slide over the back. With wire sieves it is not possible to carry over a big percentage of double oats, bosom oats, straw knobs and straws. In the lower shoe the 2 x 11 screen is useful to remove the small wild oats and weed seeds, and does good work in grading the seed. A 9 x 9 may be used if there are no wild oats.

This same arrangement is good for barley. An 8 x 8, 2 x 10 or 2 x 11 screen may be used in the lower shoe. For two-rowed barley the 7 x 7 will do excellent work.

Removing Wheat from Oats and Barley

After the seed is cleaned, the same as wheat, run the oats and barley over the wheat gang in the upper shoe. The wheat falls through the perforations and the oats and barley float over the gang and fall into a box at the back of the mill. It is necessary to shut off all the wind when doing this. In flooding oats or barley in this way the grain must not be fed too fast or the wheat cannot find its way through the sieves.

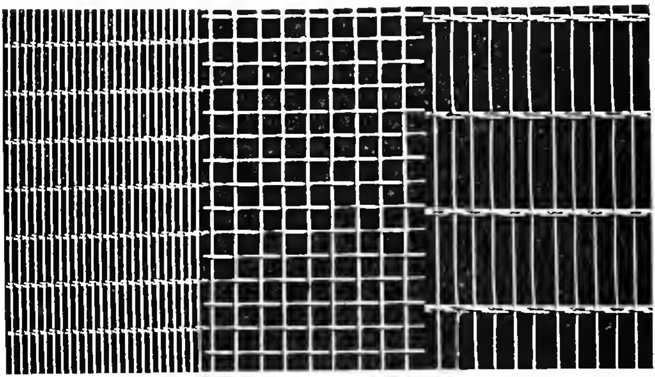


Fig. 54.—Types of Wire Sieves and Screens.
Left, 2 x 10 size; middle, 8 x 8 square mesh; right, 4 x 24 wire screen.

If it is desired to further grade up the seed wheat, oats or barley, put it through the mill again, using a larger screen in the lower shoe. There are some special graders on the market for removing wild oats from wheat, oats or barley after it has been cleaned with the fanning mill.

Turning a fanning mill by hand is not a very desirable occupation, especially in the winter-time. Larger-

sized mills, operated by power—a small gasoline engine—are on the market and well worth every farmer's consideration.

Oats and barley are of different grades when growing in the field, the same as the wheat—the large, primary oat, the secondary oat and the pin oat will be found in a single spikelet. In cleaning oats it will be found advisable to have in the lower shoe a grading screen of large enough gauge to take out the small oats and some of the secondary oats. The small oats removed can be used for feed.

Clean, good, sound seed is a necessity. It may be put in two classes—1st, good, sound, plump seed of average quality, with no special pedigree, or seed not far removed from pedigreed stock, cleaned as heavily as possible; 2nd, seed of high pedigree, produced by selection or breeding. In either case it is important that no impurities are to be found, although a trace of white cap is not serious.

There is a place in the soil for every individual seed. It is our work to see that it gets that place and that no weak seed or impurities shall have that place in the soil.

Do not expect to save all the grain in using the fanning mill. The probability is that the large grains which are carried back over the wheat gang are foreign grain, and should not be put back into the mill again. Use a good, full blast, and do not be concerned if a few of the larger grains are blown out. What grain is taken out may be marketed at a good price, remember, and the heavier the seed the better chance for a good crop.

To grow satisfactory crops it is necessary to resort to some form of seed selection in the field and to supplement this by the use of a good fanning mill.

CHAPTER XX

Keeping up the Quality of the Seed

It will ever be left to the few to hand-select seed grain and multiply it as registered seed, as this calls for a good stock of patienee in following up the work each season in detail. Also it requires intimate acquaintanee with and knowledge of the different varieties to be able to distinguish between the false and the true, and avoid errors in seed selection.

There is a great need at the present time for better seed grain than is so generally grown for commercial purposes. It is not enough that the seed be sound. It needs to be both pure and sound for many reasons. Mixed varieties or populations tend to decreased yields, due to lack of uniformity in germination, growth and ripening and in the sample of threshed grain. There is absolutely no doubt whatever of the advantage of growing grain which is the progeny of highly selected seed, instead of scrub seed or mixed races. A big percentage of the grain crops grown at present show, when headed out and at maturity, the mixture of different types and varieties. This naturally results in a lower yield than if the seed were pure and true to type. A mixture of late and early ripening grain eannot give a fully uniform ripened grain.

All things being equal—the preparation of the soil, the seed and root bed—it calls for no more effort in seeding grain of a known pedigree. The extra cost for foundation stock seed of known pedigree is trifling compared with the great advantage in growing uniform crops that produce a uniform sample, higher grade and higher price when sold as commercial grain—a safer and surer crop.

There are many growers who look upon the first outlay for pedigreed seed as an extravagance, and they are reluctant to invest even in a small quantity. They do not want to pay any more for this seed than for commercial grain. It is all a matter of education; they do not yet realize the true value of this seed. In many respects they overlook the fact that it is not necessary to buy high-priced seed to sow the whole general crop. To purchase 100 or more bushels would be prohibitive in the majority of cases, and it is not necessary to do so. The increase from a few pounds or bushels in one or two seasons is remarkable. Also it is not possible to buy the highest pedigreed seed in large quantities. For instance, hand-selected seed is not offered for sale. The progeny or the first crop from this seed is known as Elite Stock Seed. As this seed is grown only on small plots, the general average would be only from five to ten bushels, and, as the producer of this seed needs to sow as much as possible to multiply it, it can be offered only in small quantities. The increase from this seed is known as first generation seed, and by the time it reaches this standing it can be sold in larger quantities.

It Pays to Use Pedigreed Seed

There is no better investment, and few that bring quicker returns, than pedigreed seed. It is quite possible

to cover the initial outlay from the increased return from the first crop that is produced. The advantages do not stop here. In successive seasons there are increased benefits until such time as it becomes necessary to renew the supply. Where the purity is maintained this may not be necessary for some years; but in general every grower ought in his own interest to start with a small quantity and grow it on a specially prepared soil until enough is produced for the whole needs of the farm. From time to time he should obtain a fresh supply and carry on the work of producing pure seed, thus keeping up the quality.

No possible chance should be taken in respect to seed grain. The risks in grain growing are many—from drought, frost, rust, plant diseases, low germination, low vitality, etc. Seed grown from selected stock is vigorous and better able to withstand all the vicissitudes of the season and of disease than common seed.

No producer of selected seed who goes on from season to season in the production of high-class grain by selection can afford to sell this seed at anything near the price paid for commercial grain. The laborer is worthy of his hire, and none more so than he who carefully and intelligently selects his seed by hand and brings it up to a high standard. His the work, worry and care to produce, while the one who purchases this seed reaps the direct benefit in growing it without the trouble of producing it in the first instance.

There are two classes of seed growers—the one who originally produces it by selection; the other who multiplies it. The man who realizes this and makes a start in growing this seed is on the right track. It is surprising how selected seed will multiply. From a single head,

selected from Preston wheat, I have had an increase in one season of two and a half pounds of choice wheat. This amount, sown on prepared soil, would increase in one season by one and a half bushels. The third season it would be in reason to expect anything from 30 to 40

Fig. 55.—Small Plots of Specially Selected Strains of Marquis Wheat and Victory Oats.

bushels. In four years we should have 1,000 bushels, more or less, and this only from the grain in one single head of wheat.

But starting with 20 pounds of seed, sufficient to seed a quarter of an acre, it would be reasonable to expect anything from five to ten bushels the first season and the second season an increase more than sufficient for the needs of a quarter-section farm. When one starts with a bushel of selected seed the increase is more rapid.

The thing is so simple and the cost so trifling that no grain grower should miss the opportunity to start in with the highest pedigreed seed it is possible to obtain, regardless of the first cost. Any seed produced over and above the needs of the farm can easily be disposed of at a higher price than that paid for commercial grain for seed purposes. There is no chance of over-production of seed grain of high-class quality for many years to come.

Where one is prepared to lay down a seed plot to multiply this seed it is very essential that the stock be pure; for if any foreign types are in the lot they will multiply rapidly and increase in the mixture. By starting with seed of a known pedigree and keeping it pure the first season it is grown, there is less chance of mixture afterwards if only one kind of wheat is grown. In threshing the crop one can afford to keep aside the first few bushels that are threshed, taking the quantity wanted for seed toward the end of the threshing of the crop. This cannot be done when the quantity to be threshed is small, as would be the case with the first season's growing on small plots.

The value to every grain grower of selected stock seed cannot be estimated in dollars and cents.

Secure Elite Stock or First Generation Seed.

The question may be asked: "Where can I get the best seed—Elite Stock Seed?" He who can purchase this seed is fortunate to be able to do so. There is little or none offered for sale, and then only by members of the Canadian Seed Growers' Association. Should he offer it for sale he would be working against his own interests for the reason that the quantity of Elite Stock Seed he

could produce would be small, probably eight or ten bushels. The product of this would be recognized as first generation registered seed, and he is better able to sell this seed rather than Elite Stock Seed. He may have anything from 100 to 200 bushels more or less of first generation seed and can afford to sell this seed rather than the Elite Stock Seed of which he would have only a few bushels. First generation seed grown the next season produces second generation seed.

Where Elite Stock Seed cannot be obtained it is best to get some first generation registered seed, and from the most reliable grower of this seed.

Every grower in his own interests should make it a point to lay down a seed plot as soon as possible with the best seed obtainable, either a few pounds or bushels, regardless of the cost of such seed. When this is done it is only necessary for him to keep up the quality by exercising some care in seeding, harvesting and threshing to maintain the purity as far as possible, and from time to time renew the stock with the best seed obtainable.

At the time the crop is ready to cut it is essential to see that the binder is cleaned from other kinds of grain if any cutting has been done previously. In stooking the sheaves should be kept on the field on which they were grown and, when ready to thresh, the grain racks should be cleaned out. If one owns his own threshing machine he can spend as much time as is necessary to clean it out, but if the threshing is done by the custom thresher, it is advisable, where there is any possibility of other grain being in the machine, to thresh first the general crop of the same variety before the selected seed is threshed. Sometimes it is advisable to thresh the crop after oats rather than after some other variety of wheat; but it

should never be threshed—if the crop is wheat—after a barley crop, as it is impossible to remove the barley grain from the wheat. Oats or barley may be threshed after wheat as they can be removed in cleaning.

In closing this chapter I would urge every grower who is now growing ordinary seed to purchase from time to time small quantities of the best seed obtainable and sow on prepared seed plots. The only cost is the first cost for the seed. No more work or care is needed. It is no more trouble to multiply it. Get all the benefits possible without the trouble of first selecting the seed. Some one else does this for you and you reap the benefits. Only those interested in seed selection can carry on the work; but every one may multiply it from time to time with profit to themselves.

The demand for pedigreed seed cannot be met and will not be met for many years. So that any seed that is grown over and above that needed for the farm can be disposed of at higher prices to neighbors in the district. Or if one is growing it only for the market there is a distinct and decided advantage in growing good seed. This can be done only in a small way the first season as the supply of choice selected seed is limited.

CHAPTER XXI

Marquis Wheat

The exact origin of Marquis wheat is not known and cannot be determined. It is one of the descendants of a cross between Hard Calcutta Red, an early ripening wheat from India, and Red Fife.

Fig. 56.—First Generation Registered Marquis.
This wheat won the sweepstakes at the International Soil Products Exposition at Denver, Col.

The cross was made by Dr. A. P. Saunders, probably at the Experimental Farm at Agassiz, B.C., in 1892. Some crosses with these parents were also made at the Brandon Experimental Farm. The progeny of these crosses were transferred to the Central Experimental Farm at Ottawa, as well as some other crosses made with other wheats.

In 1903 Dr. Chas. Saunders was appointed Cerealist. At the time he took charge of this work he found that many of these hybrid wheats were known by name or by number. Although up to this time mass selection had been carried on, each variety, so called, was found to consist of a mixture of related types. One of the varieties isolated by Dr. Chas. Saunders was subsequently named "Marquis"; it had by this time demonstrated its high baking qualities and good red color.

In 1907 the increase of seed was sent to the Indian Head Experimental Farm for a further test. The early ripening habit, and thereby its ability to resist rust, demonstrated its value that season, which happened to be cool and wet and to play havoc with other wheats. The "Marquis" also yielded considerably higher than Red Fife. In its indication of earlier ripening habits and higher yield than the Red Fife, so generally grown at that time, the new wheat proved very adaptable to the Prairie Provinces.

In 1908 seed was sent to the Brandon Experimental Farm for further trial. The results there further demonstrated its superiority. In a five-year test (1908 to 1912 inclusive) Marquis yielded seven and a half per cent. more than Red Fife. In 1909 a field of four and a third acres gave a yield of 52¼ bushels per acre.

At the Indian Head Experimental Farm a field of five and a third acres gave a yield of 53 bushels per acre.

At the Rosthern Experimental Farm, in 1911, one plot of one-fortieth of an acre yielded at the rate of 70 bushels

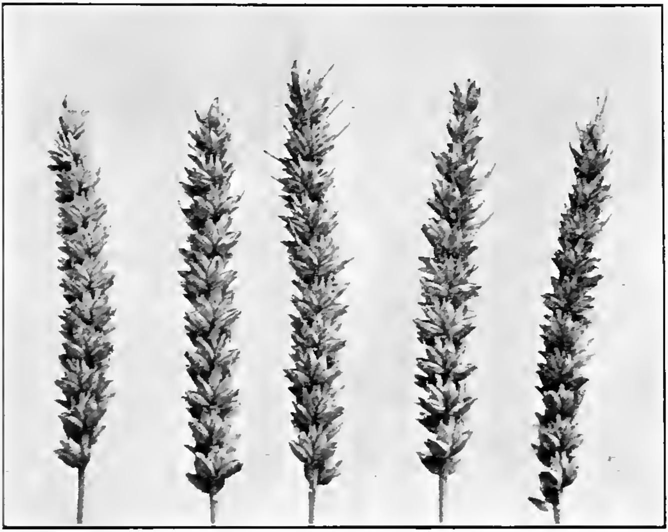


Fig. 57.—Uniform Types of Well-developed Marquis Heads.

per acre. On my own farm in the Rosthern district that season a small plot gave a return of 80 2-3 bushels per acre.

At the Indian Head Experimental Farm, in 1912, a small plot gave a yield of 81 bushels and 20 pounds per acre.

It is no wonder that Marquis so quickly jumped into popularity and at the present time it has superseded Red Fife. It has added considerably to the wealth of

the grain grower in the spring wheat growing American States. It is also being grown in Australia to some extent.

Marquis has carried a high record as a prize winner, up to this time beating all other wheats. The first time it was exhibited was at the New York Land Show, in

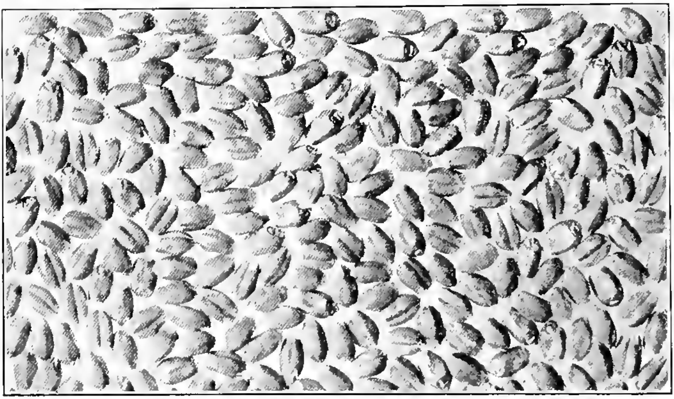


Fig. 58.—Marquis Wheat, Natural Size.

1911, and it secured the highest award in 1912 at the International Soil Products Exposition at Lethbridge, Alberta. In 1913, 1914, 1916 and 1917 it won the highest place at this Exhibition, held in various cities in the United States. In 1915 Kitchener wheat won this honor.

At all the small fairs and seed fairs Marquis has invariably secured the highest awards. It has replaced several of the hybrid wheats—Preston, Huron, Stanley and others—owing to its popularity wherever grown.

CHAPTER XXII

Red Bobs Wheat

Wanted—"a perfect wheat!"

And what are the characteristics of a perfect wheat? A perfect type of wheat should possess high milling qualities as the first consideration, high yielding qualities, good length of straw to suit every condition of the season and locality, strength of straw and ability to stand up well in heavy rain and wind storms when the crop is heavy and on rich soil, good stooling or tillering qualities that make for high yields and are necessary in seasons of drought, erect straw, and erect upright head—the head of good length and as compact as possible, differing somewhat from some of the compact club types which are short and usually leave no room for full development of the grain. While compact types are desirable, length of head should not be sacrificed for compactness. Non-shattering of the grain when ready to harvest and good separation of the grain are essentials. The grain to suit the requirements of our western standard must be of a good red color, of good size and shape, well developed, heavy and fully rounded, with a crease that is shallow to prevent lodgment of dust and dirt. Early maturity also is very important.

Some varieties are weak in the straw and are liable to lodge in a heavy crop, and in high wind storms to break down. The straw must be elastic and strong to stand up under these conditions. Such upright, strong-straw types make for resistance to disease and rust to a great extent. Where the straw is soft and weak grain rust will develop in rank crops, more freely as the stalks will lean or lodge, not allowing free circulation of air. In damp, showery weather they have less opportunity to dispel the moisture. Rust has less effect on strong-strawed types and the moisture from early morning dews and light showers is evaporated more rapidly, as the air can circulate more freely and the sunlight reach the crop. Frost has also less effect on the crop when the heads are standing up high; whereas, when the crop is leaning or lodged, the heads are nearer to the surface of the ground where the frost makes its first appearance.

Value of Erect Head

Heads that are erect on erect stems are very desirable, as in harvesting they allow of binding a close, compact sheaf, the stems and heads lying closely in the sheaf so that when stooked they make a neater and more compact stook and there is less waste of grain in handling and from weathering in the stook. Where the heads are leaning the sheaf is not so compact and the straggling heads break off in handling and do not lie closely in the stook; more heads are thereby exposed to weathering influences.

The foregoing may appear to some as being unimportant details; but it is these details that make for a perfect variety of wheat or other grains.

For several years I have been on the lookout for such a variety and have spent some years in seed selection

from existing varieties and in searching in the fields for a wheat that has some or all of these characteristics. Red Bobs wheat comes nearest to this ideal of a perfect wheat. It has practically all of these characters—the most important being the milling and baking qualities, high yield and earliness of maturity to practically escape damage from early fall frosts and rust, when sown in reasonably good time and in a properly fitted seed bed.

The origin and discovery of Red Bobs wheat may be interesting. Red Bobs is a red wheat, originated out of Bobs, a white wheat. Bobs wheat was originated by Mr. W. Farrar, of New South Wales, Australia—a household name in Australia. He contributed more varieties of wheat than any other man to the grain growers of Australia by plant breeding. Many of the leading varieties of wheat now grown in Australia are his creations. Nine-tenths of the varieties grown in Australia are varieties that directly or indirectly were produced by him.

Bobs is classed as an early wheat in Australia. It is of high milling and baking value. At some of the big grain shows in Australia in the milling and baking tests it usually stands at the top, weighing as high as 68 and 68½ pounds per bushel. Some years ago this wheat was grown on the Central Experimental Farm at Ottawa by Dr. Chas. Saunders, the Cerealist. Later it was sent to the Indian Head Experimental Farm to be grown on small plots as a further test of its suitability. While on an excursion visit to this farm I saw this wheat growing and was impressed with the evidence of its earliness in comparison with other wheats growing side by side; also with its fine character of upright, awnless head, it being absolutely free of any sign of beards.

Origin of Red Bobs Wheat

I sent in an application for some of this wheat, and the following spring secured a ten-pound sample and seeded it down on a small plot. The yield from this plot was at the rate of 60 bushels per acre—a nice sample, but of white wheat. I was not so much concerned at this

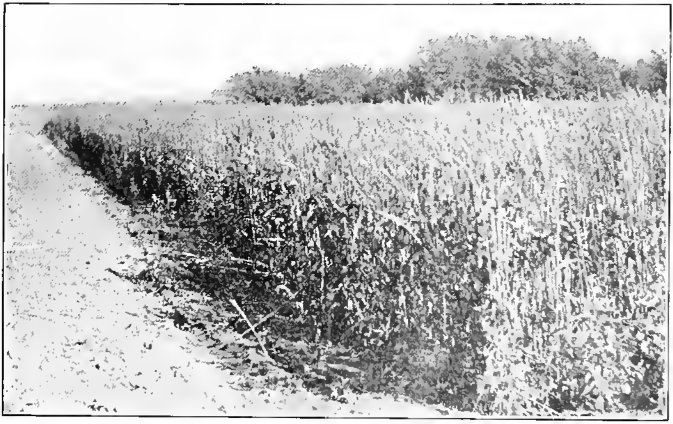


Fig. 59.—Original Field of White Bobs from which Red Bobs Sprung.

time as to the color, as I was with the earliness. The wheat from this plot was seeded on a larger plot the following season and produced another fine sample and yield. (See Fig. 59). This time I noted that instead of being a white wheat it was hard and of a straw color—a translucent color—in other words, a clear yellow color. After this time I watched closely the plots to note if I could discover any redder grains. In the meantime I was making single plant selections to improve this variety, and in

1910 I found one or two plants in my small plots that did have red grains.

This led me to search the threshed sample from the plots and larger field for more red grains. Several were found, and while the grains from the selected plants were kept separate, the lot I found in the threshed sample were naturally mixed in bulk. These were carefully planted in the spring of 1911 and watched with great interest at the time they were heading out. Those from the selected plant were true to the type of Bobs, with the awnless head, while those from the threshed sample were mixtures of different types; some were very early in heading out, others late, some had beards in full, others of a beardy character merely, with few beards, others with short beards, others again were awnless.

All of these types were different from any other sort at that time usually grown. And one of them would be classed as a distinct variety or hybrid, showing that a natural crossing had taken place.

Selection Continued

Selections were made from each one and the seed planted again in 1912. Some of these again proved true to type, while others broke up into different forms. Some were constant in the color of red grains; others in the single head row showed both white and red grains.

From the parent single plant of red grains selection again was made, and in 1913 I had about 60 different strains growing in head row plots and bulk plots. A hailstorm, on July 25th, visited the farm and some of these strains were beaten to the ground, while others were standing up well—the best with only a grain here and there knocked out of the head. This demonstrated

one fact—that some were stronger in the head and straw than others.

Selections were made again of the most promising, and in 1914 were again seeded in head row plots from single head selection and others in bulk in small plots. The summer of 1914 was a dry season; only three inches of

Fig. 60.—Different Strains of Red Bobs under Selection.

rain fell from seed-time to harvest. Some of these selections ripened fully on July 26th—a good two weeks earlier than Marquis and three weeks earlier than Red Fife under equal conditions.

In passing, I may say that my strains of Red Bobs in every season since I have grown them have been harvested, with a fully matured grain, ten days earlier than Marquis, under equal conditions, and when grown on quarter-acre seed plots have exceeded in yield from five to eight bushels per acre.

In 1915, the following season, another dry season on my own farm, with only three inches of rain, I had re-

duced the number of my selections, retaining only those that were of the Bobs type—three in number. A quarter-acre seed plot, sown alongside Marquis wheat, gave a yield of 50 bushels per acre, the Marquis of 43 bushels

Fig. 61.—Head Row Plot Selection of Red Bobs.

per acre. This seed was not sown in 1916, when a hailstorm destroyed the crops on the farm.

In 1917 Red Bobs again ripened ten days earlier than the Marquis, under equal conditions. Red Bobs, as far as Western Canada is concerned, comes nearer to a perfect wheat than any other kind of which I know, and it appears to be adapted to our special conditions, particularly by maturing in reasonable time to escape damage from frost and rust. It grows a fair height of straw, and, the straw being very strong, it stands up and does not

lodge where other wheats would go down. The heads are awnless and upright, filling more completely than the heads of other wheats.

Freedom from Tip Burning

In some seasons we find that some wheats, particularly the Marquis, suffer from tip blight; the tips of the heads turn white and dry up. Many describe this as "tip burns", due to extreme heat, sometimes to frost. If a frost comes in June, and the wheat is in the shot blade, the tips are very tender and sometimes are caught by frost so that they do not fill. However, the real cause of "tip burn" in most cases is that when coming out of the sheath, when in the shot blade, the beards at the tip of the heads are caught and held there; the stems, pushing up from below, double up the head more or less, and later on force it out of the sheath suddenly and the injury to the tip is seen in it later drying up with no grain in the tip of the head. Wheats with long beards force their way straight up through the sheath and do not show this injury.

Red Bobs is free from this defect, as the tip pushes through the sheath freely. It is one of the best of wheats for filling, and practically always fills completely from the bottom to the top of the head, whereas many wheats are often empty of grains in the lower spikelets. As early wheats cannot be expected to yield so high as later sorts, undoubtedly it is owing to this complete filling of the head that Red Bobs owes its high yielding character. In the course of individual plant selection I have found that the best heads of Red Bobs have contained from 80 to 90 grains per head, whereas I have never found this number in any other sort that has come under my hand in some

years of seed selection. Countless numbers of heads have been rubbed out for the grain for seeding in head rows; but once only, in Preston wheat, did I find 75 grains. This was the largest number I have found outside of Red Bobs.

Another good character of Red Bobs is that owing to the upright straw and heads the heads lie closely in the

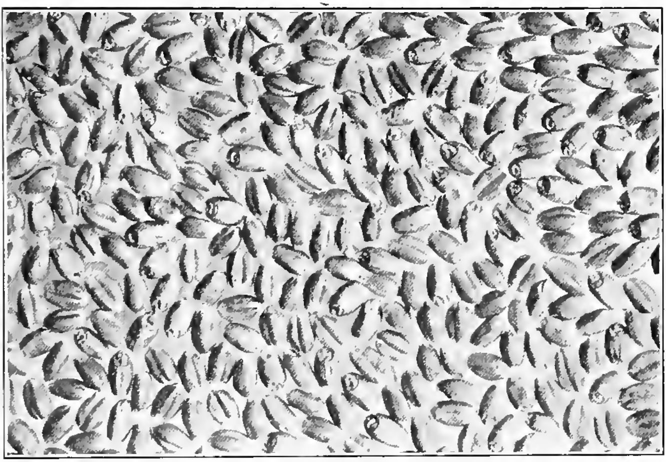


Fig. 62.—Red Bobs Wheat, Natural Size.

sheaf, preventing too much loss in handling. The grain is of good shape and size and is usually full, round and smooth, particularly in a well-developed sample. As rust usually appears in the grain crop during the first days of August, Red Bobs at that time is filling well, and although the rust may affect the leaf and stem, it will not prevent complete filling of the heads.

The exact origin of Red Bobs may be traced to an accidental or natural cross that had taken place. It

might easily have been lost if no form of selection had been going on. Many a valuable new sort is lost because it is not noticed in the course of commercial grain growing. The fact of the breaking-up of the type and some strains showing both red and white wheats clearly indicates this. These variable types are now eliminated, and only those that are constant are being multiplied. Farmers growing both Red Bobs and Kitchener wheats will be interested in the chapter on "Harvesting Red Bobs and Kitchener Wheats."

After reading the foregoing description of the fine characters that Red Bobs possesses one must not be led away by an impression that it is an absolutely perfect wheat under any conditions where sown throughout the Prairie Provinces. Of its most important characteristics—high milling value, yield and earliness of ripening—there is no doubt. Given proper treatment of soil and an opportunity, it will make good. Sown on stubble lands, without plowing, or on rough plowing without fitting the soil, or seeding on weedy lands or seeding too late in the season—under such conditions it cannot be expected to make good.

I write of Red Bobs as I know it under equal conditions with other wheats. It would not be an exaggeration to state that it will meet the requirements of the farmers of Western Canada, especially those situated in late districts where the character of the soil causes heavy growth, requiring a longer period to ripen than in drier districts. It will make for a surer and a safer crop.

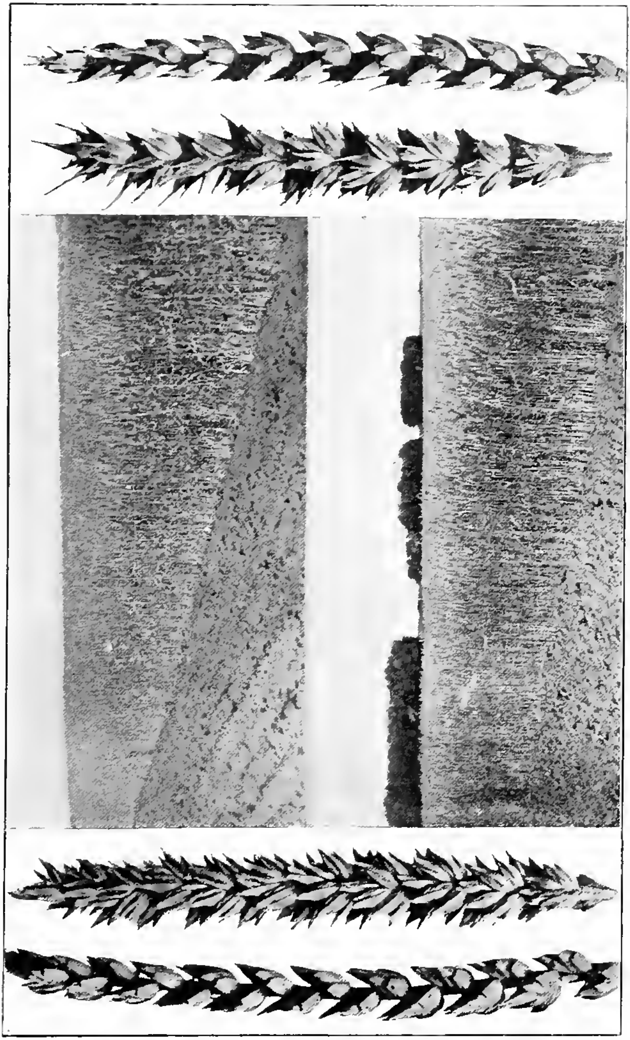


Fig. 63.—Left, Red Bobs Heads; Middle upper, Field of Red Bobs; Lower, Field of Kitchener; Right, Marquis Heads.

CHAPTER XXIII

Kitchener Wheat

For good qualities, Kitchener wheat may be classed with Red Bobs, except in earliness of maturity. Red Bobs matures earlier than Kitchener, the latter ripening at the same time as Marquis.

Fig. 64.—Head Row Selections of Kitchener Wheat.

Kitchener wheat was originated on my own farm in 1911, a single plant selection, which was made in a field

of Marquis wheat. While similar to Marquis in some respects, it is a distinct variety. The origin of Kitchener is somewhat different from that of Red Bobs. Red Bobs was the result of an accidental or natural cross between Bobs and other varieties growing on the farm, and when

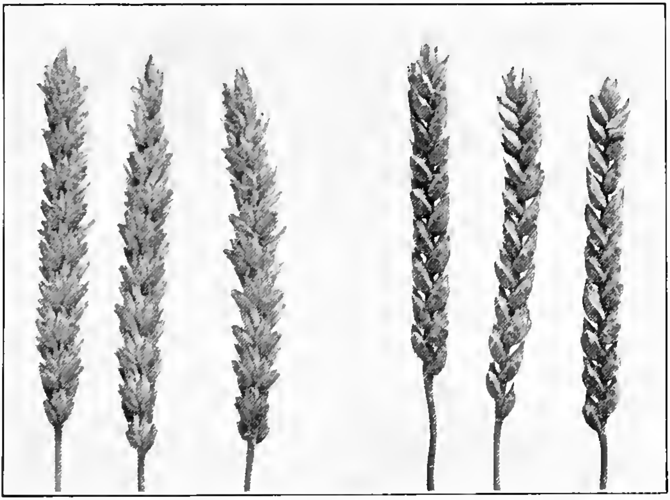


Fig. 65.—Showing Compact, Solid Type of Kitchener Heads.

first propagated it broke up into other forms. Kitchener is a mutant, or what is commonly called a "sport." It appeared suddenly and remained true and constant to type without breaking up into other forms, as is the case in natural or artificial crossings.

At the time I found the plant there was no other like it in the field, although I searched carefully. Since that time no other plants have been found except where Kitchener was sown. When the plant was ripe it was pulled

up by the roots, the grain from each head separated and kept so and sown in rows in the spring of 1912. June of that year was very dry, and owing to the hot weather all grain crops were forced into the shot blade early and the side stools died off. The drought broke up at the end of June and early July, when abundant rains fell and caused a second growth. This resulted in an uneven sample of grain, as the later stools were not mature when the first were ripe. Heavy rains at the time the grain was ready to cut caused it to sprout even while standing, and also later in the stook.

Under these conditions the Kitchener selections showed practically no injury, making a better showing than any other sort. The drought apparently did not affect it as it was uniform in growth, uniform in height and gave the best sample of grain grown that season.

Developing the Variety

In the following spring, 1913, several head selections were sown and the balance sown in a separate plot. Both selections and plots made splendid growth that season. Kitchener is not a soft-strawed wheat and its heads do not lean or bend over. This saves it in a bad hailstorm that will down the other wheats. The same applies to Red Bobs; for both wheats have stiff, upright straw and heads, so that they are not so easily swayed in the winds that accompany storms, and if a hailstorm is not too severe the heads have a better chance to escape the hail.

Conditions on the farm in 1914 were very dry, with a scant rainfall of only three inches throughout the growing season. At this time I had enough seed to sow a larger plot of Kitchener, which gave the highest yield that season—50 bushels per acre.

The season was again dry in 1915, and my farm got only three inches of rain during the growing season; but despite this fact, a quarter-acre of hand-selected seed gave a return of 80 bushels per acre. A sheaf of this wheat was exhibited at the International Farm Products Exposition, held in Denver, Colorado, and it was awarded first prize for sheaf of hard spring wheat.

In 1916 larger fields were sown to Kitchener on summer fallow and gave a yield of 50 bushels per acre, while one portion of the field that had extra treatment yielded 63 bushels per acre. Marquis wheat, sown under equal conditions, yielded 40 bushels per acre.

Characteristics of Kitchener Wheat

Kitchener wheat has practically all the characteristics I have described as necessary in a high-class wheat. When the plants are well above ground they give indication of healthy, vigorous growth. The plant stools very freely. It has a strong stem; the flag or top leaf stands out at right-angles to the stem, indicating great strength of straw. The straw is of good length, the heads very erect, of good size and compact, the spikelets being well filled and firm to the touch, denoting the size and full development of the grain. The chaff closes tightly over the grain; but while non-shattering, threshes more easily than the Marquis. The grain is of good size, larger than Marquis, and well developed, with a shallow crease.

The grain from Kitchener is large, plump and smooth. I know of no other kind of wheat that is as well developed. The heads are bald, with slight awns at the tip; when sown thinly the tip of the head is square or solid, but this feature does not show up so prominently when seeded under field conditions, and the stand is thicker.

When ripe the straw is very strong and takes on a rich blue or purple color just below the heads; a second and similar band of blue or purple shows just above the ground. Kitchener is ready to harvest when these two distinct color bands show. When the growth is heavy and the season late, however, the straw may still be green

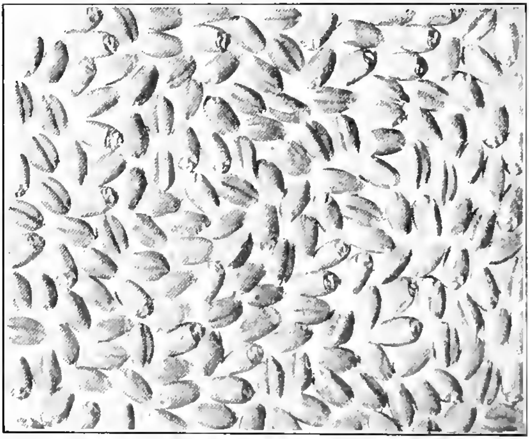


Fig. 66.—Kitchener Wheat, Natural Size.

when ready to cut; but in normal seasons of ripening these color bands appear. (See Chapter XXIV—Harvesting Red Bobs and Kitchener Wheat.—Page 286).

Where extreme earliness of maturity is not the chief consideration, and in the southern portion of the Prairie Provinces, Kitchener may have a place. Owing to its robust, vigorous, good stooling habit it should stand some drought, and its length of straw should make it desirable; also, its large, plump grain is a consideration in droughty districts. Kitchener closely follows all the

good characteristics of Red Bobs except earliness, but matures, as already stated, at the same time as Marquis wheat.

The first time Kitchener was exhibited at an International Exposition was at El Paso, Texas, where it secured the sweepstakes award for the best hard spring wheat. It was next exhibited at the Regina Provincial Fair and won a bronze medal for the best wheat on exhibition.

CHAPTER XXIV

Harvesting Red Bobs and Kitchener Wheat

It is the general custom to cut the wheat crop when the straw is ripe, or nearly so. It depends a good deal upon the season as to which ripens first—the straw or the grain. For that reason it is advisable not to take too much notice of the straw, but rather to watch the berry closely. A prolonged growing season, due to abundant moisture in the soil or cool weather, will produce greener straw than usual. Aside altogether from the color of the straw, if no moisture is found in the berry upon squeezing it is ready to cut. This was explained more in detail in Chapter XIII—Harvesting.

Now, it must be remembered that each variety of every kind of crop has its own individuality. No two varieties are alike. It is necessary, therefore, to study the characters of the crops you are growing, and it may be that such study will have a direct bearing upon the results obtained. I propose to deal now with Red Bobs and Kitchener wheat and shall describe them separately.

Let us take Red Bobs wheat first. The claim is made for Red Bobs that it is an earlier ripening sort than Marquis, Red Fife or any other wheat, with the exception of Prelude and one or two other very early sorts. To begin with, therefore, the earliness with which your

Red Bobs wheat will ripen depends upon certain factors which must be taken into account. When seeded at the same rate as other sorts, it will prove itself entitled to the early ripening claim; if sown on the thin side to make it cover as much ground as possible, or if it is forgotten that small quantities of wheat do not run through the seeder as freely as when the hopper is full, any variety of wheat will not mature as early as it can mature when given a fair show. To arrive at a fair test of

Fig. 67.—Drawing in Red Bobs Wheat.

Red Bobs as to its earliness as compared with other wheats, the conditions of sowing should be made equal or nearly equal.

Seasonable factors also enter into the test; so does the kind of land that is seeded. The period necessary to ripen wheat will vary somewhat, depending upon whether it is sown on breaking or backsetting, stubble-plowed land, spring or fall plowing or on some specially rich portion of the farm. Compared with Marquis or Red Fife, Red Bobs will be found to be an early ripening sort in any case, and if seeded under equal conditions it may be expected to mature from a week to ten days sooner than either of the varieties mentioned.

Characteristics of Red Bobs Wheat

Generally speaking, early-ripening sorts do not stool as freely as the later-maturing, their growing season being shorter. The earlier a variety of wheat ripens the lower it may be expected to yield. But this is not the case with Red Bobs. While it does not stool as freely as some sorts, it is a fair stooler, and, besides its earliness, Red Bobs possesses several other good characters in point of yield, and the yield really is the chief concern of every grower. No matter how early a variety ripens it is doomed to be discarded unless it gives good average yields. Red Bobs scores on this important point.

When growing in field or plot, Red Bobs may appear to stand less thickly on the ground than later sorts; but in spite of this it will yield equally and often better than other sorts. The reason is that Red Bobs has a solid, well-filled head, with the spikelets filled from base to tip, while the spikelets of other wheats frequently are empty at the lower portion of the head, and perhaps the tip as well. Grown side by side with Marquis on my own farm, Red Bobs has out-yielded Marquis by eight to ten bushels per acre. I do not claim that it will do so under every condition. It will ripen earlier on old land than upon summer fallow or on a very rich portion of the field.

Great strength of straw is another characteristic of Red Bobs that must be mentioned. It can be grown and stands up on lands where other wheats lodge and go down. Lodged grain does not fill properly and is more susceptible to frost and such diseases as rust and mildew; so that again Red Bobs scores a point.

The heads being very upright, strong and solid, it can be bound in nice, clean sheaves. Red Bobs threshes more

easily than Marquis, yielding short, round grain. Watch your Red Bobs closely and note when the first heads appear in comparison with other wheats growing under similar conditions.

Red Bobs may be ready to cut and left standing longer than necessary, in which case, of course, it will not show as much difference in ripening as compared with other wheats. Also, Red Bobs and Kitchener wheat may be cut in some seasons while the straw is still green, yet give a fine and well-matured sample of grain, where other wheats at a similar stage may shrink if cut.

Red Bobs has been sown this season in different parts of the Prairie Provinces under widely different conditions, on light and heavy soils and in districts of light and heavy rainfall. It may be expected to mature more quickly in the drier districts and on light soil than in the moister districts and on heavy soil where the growing period will be longer. The most important point is to note its growth in comparison with other wheats under equal conditions.

In the drier districts where the straw does not grow as tall in an average season as in moister districts, Red Bobs may ripen its straw prematurely, in which case it is important to let the crop stand and give it every chance to develop properly and mature the grain by letting it remain until the berry is quite firm. This may apply also to very light soils. On heavier soil and in districts where there is a normal or abundant rainfall Red Bobs may be cut while the straw has a green shade—that is, if the berry is fit, as I have pointed out.

To sum up, the outstanding characteristics of Red Bobs are its early maturing qualities and average good yields; it may be harvested safely before early fall frosts or rust

can injure it, and thus also extend the period of seeding a few days longer in the spring than is now wise and safe with Marquis, Red Fife or other wheats, especially when sown on spring-plowed lands.

Characteristics of Kitchener Wheat

As these have been dealt with in a special chapter, it is only necessaary to point out a few main characteristics

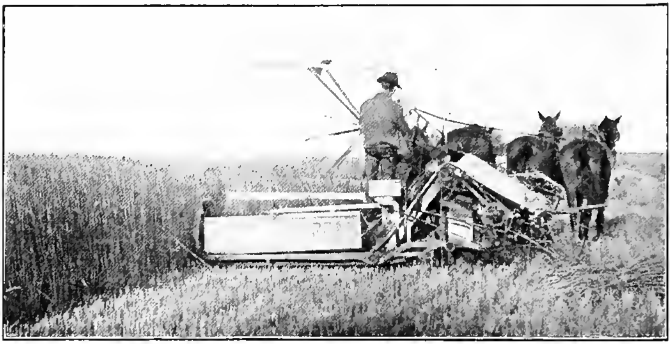


Fig. 68.—Harvesting Kitchener Wheat.

of Kitchener. Grown under good average conditions, it shows a good length of straw and an upright head, usually well filled. I know of no other wheat which fills in the head so completely and full and plump and smooth.

When properly matured the heads of Kitchener are heavy and solid, indicating good yielding qualities. The grain is of large size. It stools freely and the stand on the ground is heavy—more so than any other sort I know about. Consequently Kitchener does not mature any earlier than Marquis; but it is no later under equal and normal conditions.

At maturity Kitchener shows a blue or purple band of color on the straw just below the head, and a similar band near the ground. It is ready to cut when it reaches this color-band stage, and should yield a fine sample of grain. There is the probability that it will not take on this color of straw when sown on rich land, owing to the prolonged growth. Even if this is so, it may be ready to cut. Kitchener and Red Bobs are alike in this respect.

On my own farm I cut Kitchener, grown on summer fallow in the season of 1917, while the straw was still green, and obtained a fine sample which yielded 50 bushels per acre; on a portion of the field which had special treatment it yielded 63 bushels of fine grain per acre. The straw was quite green, nearly five feet tall Grown on Brome sod land, the straw was fully ripened off and the grain not so good a sample because it had been forced by dry, hot weather.

A farmer who is growing Kitchener for the first time would do well to take note of the foregoing. Do not make the mistake of allowing the crop to stand too long. waiting for the straw to ripen; the season may be backward or your crop may be growing on rich land. In the drier parts of the West, Kitchener should make a good showing, because of its heavy growth, length of straw, and smooth, well-filled berry.

Examine the berry to determine when Kitchener is ready to cut. Look to see if the smooth part shows a whitish or amber color tinge. If no moisture is found when the berry is squeezed, if it is in the firm dough stage, and the season for harvesting is getting late, cut it. Hardening of the berry will be carried on in the stook when cut while the straw is still green.

Red Bobs and Kitchener are very similar in respect to strength of straw and well-filled heads. It is hoped that they fulfil the promise of general field success under all conditions that they have given in the severe tests through which they have passed already in the multiplying plots.

CHAPTER XXV

Victory Oats

The Victory oat is fast becoming the leading white oat grown in Western Canada, and it is possible that it may take the leading place over all other well-known sorts.

Victory was originated at the plant-breeding station at Svalof, Sweden. It is one out of a great number of selections made from individual plants in the field out of a variety of oat known as "Probstier", commonly grown in the Baltic region. It proved to be the best among a large number of selections, and it is the leading best sort of oat yet produced at Svalof.

In 1908 it was sent out from the Svalof Station under the name "Seger", which means, in English, "Victory". It was soon introduced into Canada, where it again demonstrated its high qualities. While it is still being sold and grown under the name of "Seger", it is recognized by the Canadian Seed Growers' Association only as "Victory".

In point of yield and quality, American Banner and Victory are in a class by themselves, specially adapted to our Western conditions. Victory has many good qualities which some other sorts do not possess. When it comes to the quality of an oat variety I would place high yield first. For feed purposes all oats look alike, while

ability to yield is a character. While some sorts may show up well under specially favorable circumstances they may fall down under average conditions. Victory makes good under all conditions, as high yield is a characteristic of this sort.

The quality of the oat for milling should be considered—the flavor, and the low percentage of hull to ker-

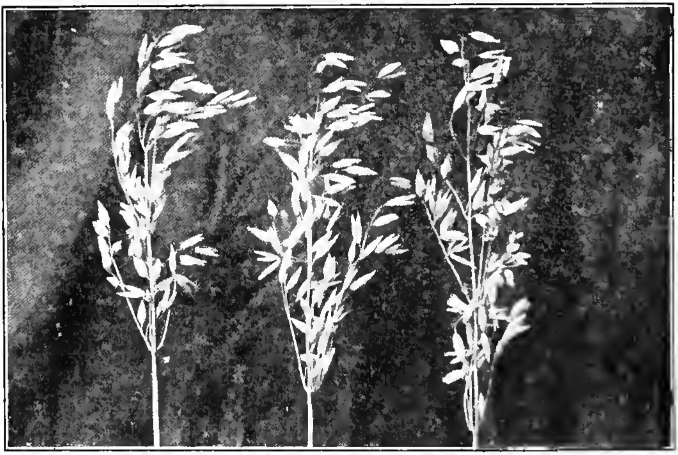


Fig. 69.—Showing Desirable Type of Victory Oats Heads.

nel. Victory has a comparatively thin hull. It has a rather short head, with stiff, upright branches. To many who are not intimately acquainted with Victory the appearance of the head may be misleading as to size; one would be apt to pass it by in favor of other sorts with larger heads. But its yield is much greater than the size of its head would lead one to expect. Size of head and appearance alone do not always indicate the yield.

Characteristics of the Grain

The grain may be classed as a medium oat, between the short and the long slender oat. In size it cannot be classed with the Abundance oat, which is short, thick, plump, and weighs well per bushel. Weight per bushel is determined or influenced by the shape of the grain. Short, plump oats pack more closely and weigh more than those that are longer and thinner, and one should not place too much reliance upon the weight per bushel. One is also liable to be deceived by the thickness or weight of the hull. While some sorts are thick and plump the hull is thick and heavy in proportion to the kernel.

Victory has a thin hull. At Svalof it stands highest in this respect, with the exception of Gold Rain, a sort likewise originated at Svalof. Grown in Western Canada, it makes a good showing as the best and highest yielding early oat with thin hull.

Victory possesses all the good characters desired in an oat—high yield, high qualities of head and straw, good size and shape of grain and thin hull, making it a very profitable sort to grow either for milling or feed purposes. It is classed with the American Banner in this respect. Personally, I have found it to excel the Banner in some ways; yielding higher, it has also a larger, plumper grain.

While it is generally understood that characters in a sort among the small grains cannot be changed by selection, I am not inclined to that opinion. Since 1912 I have been making plant selections of Victory for absence of awn. While Victory has but a slender awn, I would prefer to grow it free of any awn. I have succeeded in eliminating practically all the awn by plant selection. I

have got it at least up to 90 and 98 per cent. free of awn, and individual selections that show only one or five awns per head and per plant. Further experiment will demonstrate whether or not the awns can be almost or entirely eliminated by selection.

Many recognized sorts possess thick, coarse awns. This is not desirable in an oat. In respect to high yield any kind of grain may make a good showing under special conditions, particularly when grown on well-prepared summer fallow. The true test is in the showing under other conditions, when grown on fall plowing, spring plowing or stubble lands. Before any new sorts are sent out they ought to make a satisfactory showing under all conditions. They may not show up well in point of yield, length and strength of straw, or quality of grain. As oats are seldom given the fallow, this being reserved for the wheat crop, but are mostly sown on stubble-plowed lands, an oat should show up well under these conditions.

Experience with Victory Oats

Since I first grew Victory oats on my own farm they have made a better showing than any other sort. Grown on the fallow, the yield has been as high as 130 bushels; even this yield can be surpassed in better favored oat districts like some in Alberta, on spring-plowed stubble after a wheat crop.

In 1914-15, two dry seasons with only three inches of rain on my farm from seedtime to harvest, the yield was 80 bushels and slightly better per acre. In 1916 an equally good crop was destroyed by hail. In 1917 I obtained 80 bushels and better on three different fields.

I refer to this as showing decisively the high yielding

qualities of Victory. Similar results may be quoted from others' experiences. My results were obtained in a district where one might expect anything from 40 to 60 bushels as a satisfactory yield under the conditions of seeding and growing oats. These yields—80 bushels per

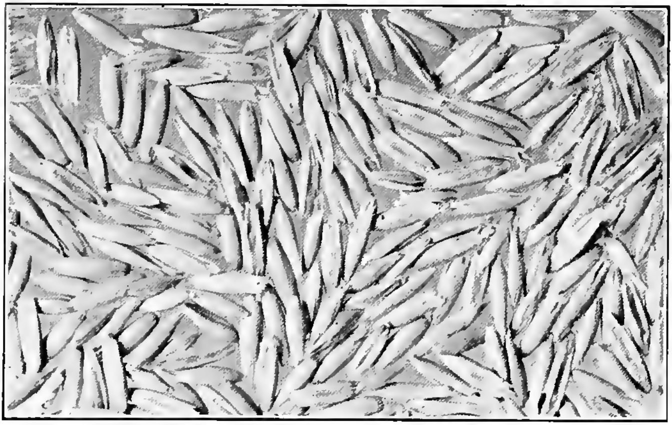


Fig. 70.—Victory Oats, Natural Size.

acre—have never been reached on my own farm or elsewhere by myself with any other sort.

Such an oat as Victory is worthy of recognition. Owing to its fine straw and erect head it makes a fine crop to harvest, as it packs closely in the sheaf. A hand-made sheaf of Victory oats is a joy forever and will make a most handsome sheaf for exhibition. It is aristocratic—nothing coarse or common in its appearance when growing in the field, when harvested or when threshed.

A sheaf of these oats was exhibited at the International Farm Products Exposition, held in Denver, Col-

orado, and it won me first prize and the sweepstakes over every other kind of grain—oats, wheat, barley and rye. It also brought me a sulky-plow as a premium. Wherever I have exhibited a Victory sheaf it has never failed to bring me a high prize.

Understand, I am not wedded to any particular variety of grain. The chief reasons for growing any particular variety is its suitability to our conditions and its high characters. As soon as any better sort surpasses it I am ready to drop a variety in favor of one more profitable.

Quality is to be desired in any sort. The question is not only "How much?" but also "How good?" The Victory oat can be recommended, and no more appropriate name could have been given to it.

CHAPTER XXVI

Canadian Thorpe and O. A. C. Barley

When Dr. William Saunders was appointed Director of the Central Experimental Farm at Ottawa in 1887 he saw the necessity for improvement in the barley crops and the introduction of more suitable varieties of barley. One of the sorts which he introduced in Canada was given the name of "Canadian Thorpe", a two-rowed sort.

Away back some 30 years ago I secured a sample of this barley from the Experimental Farm, and I have not forgotten the growing of my first crop. At that time I had a farm on the banks of the South Saskatchewan River, about 18 miles north of Saskatoon, on the west bank of the river. One corner of the farm was in the river itself, and the house was situated on the bank. The river bank being high here, the snow usually left the ground early in the spring. The first lot of the Canadan Thorpe seed was sown on new breaking and ripened a fine crop the last week in July, large, fine, plump, meaty grains such as I had never seen before.

Some years later I moved to my Rosthern farm and brought the seed with me. I am still growing Canadian Thorpe, and since the first year I grew it I have never had a crop failure or a frozen crop.

Wherever grown, providing it is kept from weathering, Canadian Thorpe will prove a prize winner at exhibitions; but its value does not lie in prizes won. It is a sure cropper and yields well. It has always been a puzzle to me why farmers will grow the small, six-rowed sorts in preference to a sort like Canadian Thorpe, a two-

Fig. 71.—Canadian Thorpe Barley Heads.
Two heads at right show how awns fall off about 75 per cent. of the crop when ripe.

rowed barley, when such large, meaty grains can be grown. Whether sold commercially or grown for feed purposes it is superior. When crushed for feed there is a large percentage of grain in proportion to hull. Canadian Thorpe is vigorous in growth and owing to its heavy growth it is not so suitable for rich land or the

well-worked summer fallow; it is liable to go down in heavy rain and wind storms. It is more suitable on breaking, fall plowing or spring-plowed lands.

The fault does not lie with Canadian Thorpe alone, but applies equally to other two-rowed sorts. In fact, Canadian Thorpe is able to stand up when some other sorts go down. In point of strength of straw and good erect heads it cannot be surpassed by any other sort.

Canadian Thorpe barley is of the erect, or Duckhill, type, in contrast to those of the nodding, or Chevalier, type; the latter have longer and more open ears than the Duckhill type, but not necessarily more grains. Canadian Thorpe has a compact head—anything from 14 to 18 pairs of spikelets.

Selecting an Improved Strain

By selection I have evolved a stiffer upstanding type that may be grown on the fallow fairly well without danger of lodging. This is a selection from some I made some years ago from a portion of the field which, owing to its rank growth, had gone as flat as if a steam-roller had passed over it. A few heads only were standing, and these I selected for a stiffer and stronger straw. One plant selection I know as "No. 4" is very stiff, but shorter in the straw; when ripe, the beards fall off; owing to the shortness of the straw it would not do for a dry season and it is not being increased. Other and more desirable selections, however, are being multiplied and grown. This shorter and stiffer straw selection may have some value where it is desired to cross with other sorts to get the strength of straw and shattering of the beards. The other selections now grown shatter the beards to some extent when ripe.

While two-rowed sorts do not ripen as early as do the six-rowed sorts, Canadian Thorpe can be seeded early enough to ripen the crop safely. When sown on the fallow it should be in the ground reasonably early—from May 1st to 10th—as the crop will be heavier and will take longer to ripen. On breaking or backsetting it may be

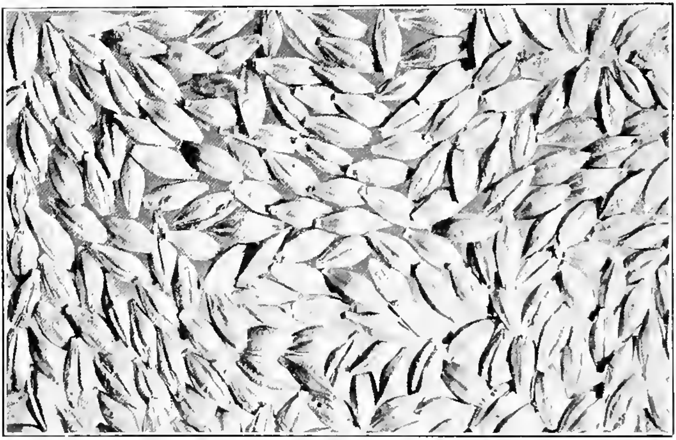


Fig. 72.—Canadian Thorpe Barley, Natural Size.

sown about the same time. On fall or spring plowing it may be seeded later—anywhere up to the last week in May. If it is sown on fall plowing an opportunity is provided for destroying weed growth by cultivation previous to seeding. When sown on spring plowing the plowing should be deep—at least six inches—to bury any weed seeds or couch grasses and to allow the crop to get a start.

Canadian Thorpe, selected strain, will stand up better than any sort of which I know. I find it most profitable

to grow it after a wheat crop by plowing in the spring, as it is a simple matter to remove any wheat that may volunteer and get ripe; running the barley over a wheat gang in the fanning mill will do it. By growing it after a wheat crop the growth is not so rank and the crop does not lie down.

When harvested, Canadian Thorpe barley packs closely in the sheaf, and as the heads lie closely, loss of grain from shattering when handling is avoided. It threshes cleanly, the beards being brittle and threshing readily. In short, Canadian Thorpe has many fine points to recommend it to anyone desiring to grow a barley crop.

I know of only oue sort that will equal it in yield, and that is Hanchen barley, a two-rowed sort of the nodding type that came from Svalof, Sweden, and stands at the top of all the varieties grown there. Canadian Thorpe has given me many good yields on summer fallow—as high as 76 bushels per acre on spring plowing. When the land is plowed six or more inches deep, this barley seldom goes less than 50 bushels per acre.

Incidentally, Canadian Thorpe has brought me more top prizes than any other kind of grain—so far as the number of prizes is concerned. The wheats, of course, have won the most valuable prizes.

O. A. C. No. 21 Barley

O. A. C. No. 21 barley is one of the leading sorts grown in Canada. It was originated at the Ontario Agricultural College, Guelph, Ontario, by Professor Zavitz, and is one out of several thousands of plant selections taken from a variety known as Mensury. It was the best selection after some years of trial.

Manchurian is another selection out of Mensury, made by Dr. Charles Saunders, Cerealist, at Ottawa, and it also is a good sort.

Wisconsin Pedigree barley is still another selection out of Mensury, made by Professor Moore, of the Wisconsin Agricultural College.

Fig. 73.—O. A. C. No. 21 Barley, Showing Erect, Firm, Compact Type.

All of these selections are an improvement on the sort from which they were selected. This provides another very convincing proof of the value of selection of individual plants made in the field.

O. A. C. No. 21 differs somewhat from Manchurian and Wisconsin Pedigree. It is very strong in the straw and

does not shatter the grain so readily as Wisconsin Pedigree. It has a distinctive color of grain that Manchurian and Wisconsin lack. It has raised the average yield of Ontario 7½ bushels per acre, and it is grown with success in the Prairie Provinces.

O. A. C. No. 21 is distinguished by the blue color of the grain under the hull, or, when growing, by any one

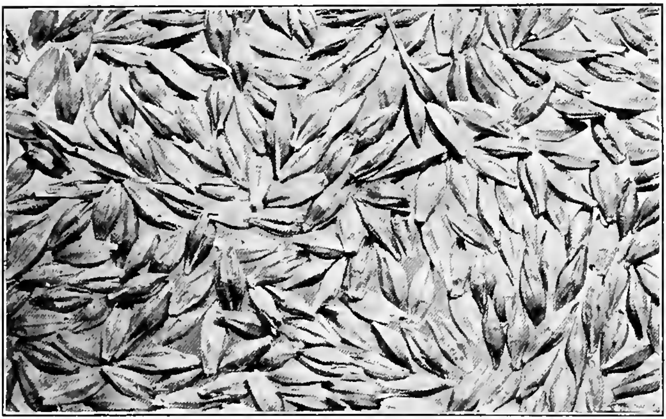


Fig. 74.—O. A. C. No. 21 Barley, Natural Size.

of several distinctive characters. It has a very close, compact head and holds the grain tightly, whereas some other varieties are loose and open in the head so that the grain is easily shattered when ripe. It has a good length of straw, and in strength the straw is unequalled. The heads are of good size, although shorter than some other sorts because of compactness.

Its only objectionable features are the blue color of the grain and the tenacity with which the beards adhere to the grain; this is to be expected, however, in a sort which

does not shatter its grain easily. Because the beards do not thresh off easily, requiring close threshing, there is danger of injury to the germ. When the beards adhere to the grain it does not flow freely in the grain drill and does not pack closely enough to weigh well.

O. A. C. No. 21 is a little earlier than some sorts and stands handling at threshing. It yields well and stands up without lodging. It is, therefore, a very desirable sort to grow. The blue color may be eliminated by selection; also the tenacity of the beards. I have made several selections of this sort that hold all the other good qualities, with a yellow cast of grain instead of blue, and also looseness of beard; some of the beards fall off when ripe. I have managed to retain in these selections the fine compactness of head, the strong straw and the apparent good yield.

With the O. A. C. No. 21 I have secured several prizes. At the Provincial Seed Fair of Saskatchewan I secured a gold medal and a silver trophy. This cup has to be won three times to hold it permanently. Besides it I have secured several other prizes with O. A. C. No. 21 at different fairs and some at the International Farm Products Exhibition.

CHAPTER XXVII

Selecting and Growing Potatoes

To make potato growing a success it is essential to fully understand the requirements of the crop. The kind of soil they are to be grown on is not so important, providing the soil is properly fitted for the seed and maintained so throughout the growing season. It should be fully understood that the tuber is a swelling, and to swell and develop into a potato of nice type and shape, of good size, the soil must be in a proper condition to let it do so. At no time should the soil be allowed to become hard or compacted or dry. The potato revels in a nice, moist, loamy soil. Even if selected from the bin or hill from selected stock, the best of seed when planted in a shallow, hard soil, or deep soil that becomes hard or compacted, will be disappointing when harvested. The tubers will be deformed or irregular in size and shape and contain a large number of small tubers that are not worth the trouble of picking up.

Selection of Seed

The seed should be given first consideration in order to secure the best results. It should be selected at the time the crop is dug or harvested. The best results are gained when the hills are dug by hand, so that the pro-

duct of each hill may be compared. When this is done the best hills may be determined. The important part for the beginner is to be able to determine what constitutes the best hill.

Selection should be made not particularly for the largest tubers or the largest number of tubers per hill, but from hills that yield the most uniform potatoes in size and shape—hills that contain six or eight or ten clean, shapely tubers of good marketable size, besides the few small ones. Trueness to type is another consideration. Those that come nearest to the point should be selected for seed. Six or eight tubers should be selected from each hill, or sufficient to plant eight hills the following season, these being planted in a single row. This row is therefore the product of a single plant or hill. As many as desired may be chosen, probably about thirty hills will be sufficient, making 30 rows. These may be used as a seed plot for future foundation stock. This work should be carried on each season. At the time these hills are selected they may be either kept separate or all the seed massed together and planted in rows, with eight hills to the row.

Deciding on a Variety

With respect to variety, one cannot recommend any particular variety but one suitable to the locality, of either early or late sorts. Some varieties are round in shape, others long, some round oval, others flat oval, others of type between these. Personally, I favor the clean, full, round and slightly oval type, there being less waste in peeling and cooking. They handle better in shipment than the long and flat types.

In the selection of type or variety, one should determine which is the best. Each variety has characteristics

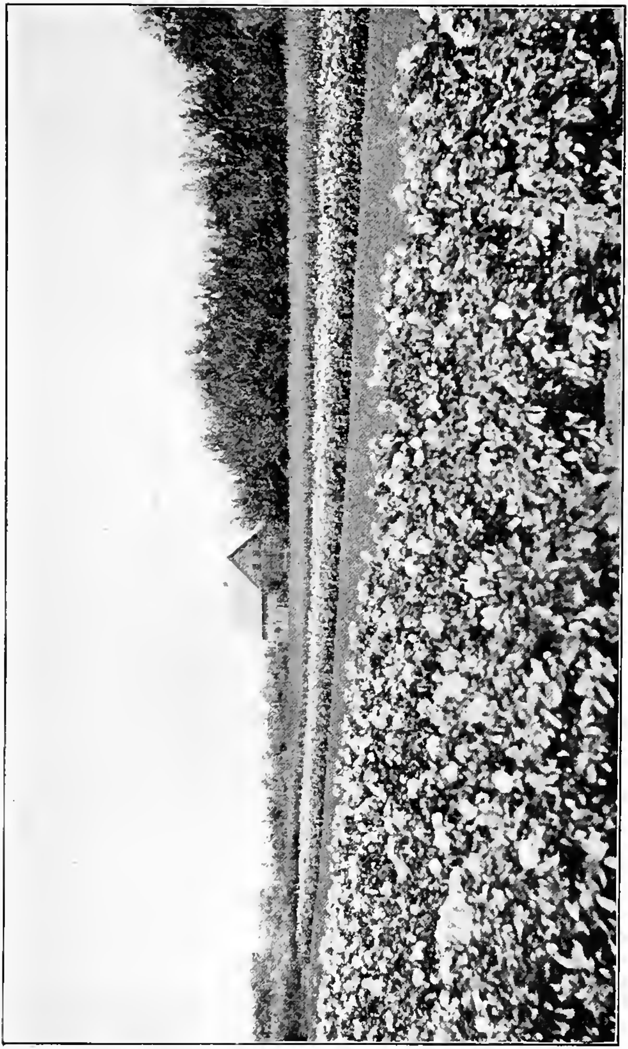


Fig. 75.—Potato Plots on Seager Wheeler's Farm.

that must be taken into consideration. For an example I might refer to two different types, Early Ohio and Wee MacGregor. The former is an early maturing red potato, the latter a white late sort. In making selections for type or shape it may be puzzling to some to determine which is the best to select. Early Ohio is a round type, in color ranging from dark red to light red and brown red. In shape it ranges from round to a longer type; gradations of these may be found in a single hill. Having had the variety under selection, I am selecting for the slightly longer than the round type, as I find them cleaner and more handsome. They do not yield as high as the late varieties, but have excellent cooking qualities, are a fine flavor and are good keepers and shippers. The tuber clings closely to the plant, making harvesting easy. In contrast, Wee MacGregor is a late sort, white in color, yields heavier than the Early Ohio, but the tubers are irregular in size and shape. Some of the tubers incline to a long, flat type or oval, flat type. The tubers sprawl away from the plant, making harvesting more difficult than with the Early Ohio, otherwise they are a desirable sort. Seed selection along these lines will be found both interesting and profitable.

Hardening Off the Seed

The seed before planting should be greened or hardened off. This may be done by spreading the seed thinly in some place where there is no danger of freezing in the early spring, on the floor of a shed or building. The light or sun turns them green and induces a short, solid sprout that will not break off in handling. If there is no convenient place inside to do this, the tubers may be spread on the ground outside in the south side of a build-

ing and at night covered over to protect them from frost or rain. Seed thus treated will come through the ground more quickly after planting, and is apparently more vigorous throughout the growing season. Before planting they should be treated for scab in a one-to-thirty solution of formalin, allowing the seed to remain in the solution from two hours to half a day. They should then be taken out and dried, when they can be cut up for seed or planted whole.

Plant good-sized seed. Don't cut too closely. While it is true that peelings will grow, it is also true that some of the peelings may not grow. It is a practice with many to cut the seed to a single eye. This would be all right when the piece is large, but there are some blind eyes, and there is a possibility that some of the seed may only have one eye and that a blind one, which will result in a miss in the rows. It is poor economy to skimp the seed. Allow two or more eyes to each piece of seed and let it be of good size. If a tuber is to be cut in two pieces, cut lengthwise down from the seed end to the stem end. This is a practice I have followed for the past 25 years of planting only good-sized seed, and I have never known a crop failure or even a poor crop, even when the crop was hailed so badly as to cut and strip the plant to only a few bare stems. The crop came along afterward in good shape, simply because the plant was established with a good rooting system.

Preparation of the Soil

The preparation of the soil for the seed and the cultivation after the crop is planted is of greater importance than the seed itself. To encourage the development of clean, large, shapely tubers it is necessary to have a

moist, fairly loose, deep soil. This is hardly possible when the plowing is shallow and the lower portion is hard and compact. This hard and compacted condition may be brought about even in a deep soil if cultivation is neglected at the right time. Heavy rains will run the soil particles together, and rapid evaporation will take place unless the surface is maintained in good condition. When the soil is dry enough, cultivate to maintain the desired mulch.

There are several methods of planting the crop, but the general practice is to plow the seed under. When this is done the plowing should be as deep as possible, right down to 10 inches deep, the seed being planted about four inches from the surface. This may be done by following the plow and pushing the seed into the side of the furrow, instead of dropping the seed. In the case of early varieties they may be planted about 15 inches apart in the row. Late varieties should be about 18 inches apart. The rows for early varieties may be about three feet apart; with late varieties about four feet. This allows room for each individual plant. Early varieties have a small top, late sorts a heavier top of vines. This allows the potatoes plenty of room to develop into strong, vigorous plants and reduces the possibility of suffering in a period of drought. The furrows should be made straight to allow of easy cultivation between the rows.

Cultivation after Planting

When the seed is planted, it is advisable in general not to pack the soil. It may be lightly planked down by the plank drag if necessary to pulverize any heavy lumps of new soil. The surface should be harrowed two or three times at the time the crop is in, and at intervals

several times before the crop is showing well above the ground. The harrowings save considerable labor, as the harrows destroy each crop of small weeds as it germinates, and makes the after-cultivation easier. As soon as the rows are beginning to make some growth the horse hoe should be used between the rows, even if no weeds are showing. The first cultivation may be done deep, but after-cultivation should be shallow, as the roots soon spread across the space between the rows. If any small weeds are showing in the rows around the plant, the cultivators should be set to throw a little dirt over the weeds to smother them. At least three cultivations should be given during the growing season, particularly after heavy rains, when the soil is just dry enough to cultivate. After the plants have finished blossoming, a slight ridging of the rows should be done to protect the tubers from sunburn or early fall frosts. It must be considered that the tubers grow above the seed that is planted, and not below. They naturally push up near the surface and need protection from frost and sunburn. Previous to the ridging the cultivation should be on the level at all times.

When the rows are hilled up early in the season the roots are severely pruned, which injures the plant. While the tubers grow near the surface the roots go down deeper and spread out between the rows in all directions. Care should be observed not to destroy the roots. The soil between the rows should be kept loose near the surface at all times to prevent evaporation of the moisture from the lower depths, and a hard crust should never be allowed to form. When the foregoing system of cultivation is carried on there will be no need to hoe or hand-pull weeds between and in the rows. The crops should be free of weeds at all times.

Probably the best place to grow the crop is on summer fallow, but it should not be grown on stubble land plowed under at the time of planting. When the intention is to plow the crop in on a stubble land, the field should first be plowed shallow in the fall and harrowed and packed, and then plowed deep at the time of planting.

Fig. 76.—Potatoes Growing from Selected Seed.

Many crop failures are due to plowing under coarse stubble. It is not the intention here to go fully into the different methods of planting. The seed may be planted by hand, or with the plow, or with the planter. When it is done with the plow a good method is, instead of dropping the seed and plowing it under, to first plow the field deeply, and when the field is plowed to drop the seed in the slight furrows left by the plow and press the seed in four inches deep with the heel, taking every third or fourth furrow, or the same result may be accomplished by using a hand planter. This allows the plow-

ing to be done quickly and the team to go on with other work, when the planting may be done more leisurely. When completed, the field may be harrowed, as usual. The soil being loose, it is easy to press the seed in with the heel. To sum up the foregoing, the important point to observe is to plant good seed, having the plowing deep and moist and kept in that condition by cultivation throughout the growing season, preventing the soil from becoming dry and hard.

There are many different styles or makes of cultivators. The common scuffler is a good implement to use. One with narrow points, instead of the blade or duckfoot style, should be used, as the blades have a tendency to harden the soil below, although they are good to tear out weeds. The points do best work, as they open up the soil to aerate it if used judiciously and not too deeply so as not to injure the root system.

In harvesting the tubers they should be left on the ground for two or three hours to dry and harden, when they may be handled with less chance of bruising than when picked up as soon as dug.

A deep soil and cultivation by several harrowings early in the season when the crop is planted are most important points. These, and cultivation kept up between the rows during the growing season, are the chief factors in the production of a bumper crop, as there is no possibility of weeds gaining the slightest hold. I consider the early harrowings very important.

How Prize-winning Potatoes were Grown

The potato exhibit that won the sweepstakes at the International Soil Products Exposition in 1917 was the Early Ohio variety. The original potatoes I purchased

a few years ago, and from this seed I have made special hill selections each season for uniformity of type and size. Early Ohio is an early maturing sort of excellent cooking quality and fine flavor. It stands handling in shipping and is a firm, hard keeper, keeping well into the late spring. The general type is roundish, but inclines to the oval type as well. It is generally dark red in color, but the color ranges from dark to light red to brown red. The type that appeals to me, and which I am selecting, is the oval shape of light red color.

This variety was grown side by side with Gold Nugget. Gold Nugget was awarded first prize in the classes open to all, in the general section, which admits exhibits from irrigated sections, as well as from dry farm sections. It also won first prize in the dry farming section, in which a separate exhibit was necessary. Although the judges awarded Early Ohio the sweepstakes, I, personally, consider Gold Nugget a superior variety in every respect.

The field on which these two prize-winning sorts were grown was devoted to wheat plots the previous season. This crop was hailed out in 1916, was mowed and raked off the field. In the fall this land was plowed as shallow as possible to encourage the germination of volunteer grain. In the late fall and winter stable manure was spread on the land, and in the spring, after the melting snow had carried the soluble portion into the soil, the strawy portion was burnt off. At the time the potatoes were planted the land was plowed eight to ten inches deep, and the seed planted four inches deep into the edge of the furrow. The rows were 30 inches apart, closer than I usually plant, but I wanted to plant the crop on this particular field, so the crop was crowded. Some allowance was made, as early varieties may be planted

more closely than late or main crop varieties. Early Ohio and Gold Nugget are both early sorts.

After the seed was planted it was lightly disked to pulverize the rough soil turned up by the plow from the lower depths. I would advise against this operation unless some judgment is used, as there is a possibility of turning out some of the seed. After the operation the field was harrowed several times at intervals until the plants were showing up well in the rows.

Cultivation was then given with the horse hoe three times during the growing season until the rows were overgrown with the tops, when cultivation was not possible. When the rows are four feet apart, cultivation may be given until later in the season. The season was only fair for the potato crop, but a good crop of all sorts was harvested. We had some long, dry periods throughout the season, but the early cultivation offset this handicap to a great extent.

Under equal conditions on this field side by side, Gold Nugget gave far better results in yield, uniformity of the type, size, shape and other qualities. Early Ohio is one of the earliest varieties grown, but Gold Nugget is equally as good in this respect. It is noteworthy that the Gold Nugget won in two separate classes.

CHAPTER XXVIII

The Importance of Fairs

A big majority of grain growers do not fully realize the importance of fairs. This is evidenced every season in the small number of grain exhibits at the local summer fairs, the district seed fairs and the summer industrial fairs. Not only are the exhibits of threshed grains and in the sheaf very limited numerically, but they are usually poked away in some corner, sometimes passed by unnoticed, when they should form the most prominent exhibits.

All kinds of stock receive the greatest attention at the summer local fairs and the larger industrial exhibitions. The grains and grasses and forage crops that go to build up the animals get scant attention or recognition. With a few exceptions there are very restricted exhibits even at the seed grain fairs which are held throughout the country in the fall and winter. For some years past I have acted as judge at many of the seed grain fairs and have been impressed by this fact. I might fairly state that if an average were struck, the number of grain exhibits would not be more than ten or a dozen. In some places I have seen less than half a dozen, while from one dozen to twenty would represent the maximum showing.

What is wrong? Grain crops are the staple crops. Where lies the fault? Indifference on the part of the grain grower, for one thing; lack of a full appreciation of the importance of the fair to the individual grower and his district for another. The importance of the fair ought to be fully realized by the producer. The seed grain fair is the place for him to put his seed grain on exhibition, if only to advertise it to some extent. It is here that the producers meet one another to compare the different exhibits and the quality and value of the seed offered for sale. It is indeed regrettable that the number so meeting is so few. When seed grain is wanted the seed fair is the place to find it, to get in personal touch with the producer. The provincial departments of agriculture do much to encourage the seed grain fair and to make it a success; they go to expense in sending judges competent to pass fairly upon the exhibits and in sending speakers qualified to address the gathering upon live farm topics and to discuss various farm problems which may affect the farmers of the district. Much benefit will result if the farmers themselves will but take an individual interest in the seed grain fair.

Better Grain Exhibits Necessary

Every grain grower should make it a point to enter an exhibit. In the first place, grow the best seed possible, using the very best foundation stock grown on specially prepared seed plots. This will encourage better tillage. The man who buys a bushel or two of the highest pedigreed seed at a fancy price naturally will put it in specially prepared soil. The results obtained will demonstrate the benefits of good tillage as well as the superiority of such seed over the ordinary run of

seed, thereby encouraging the special preparation of the larger fields in the same way. Inferior varieties, mixed varieties, mixed types and strains will be eliminated; the standard and quality will be raised. Placing an exhibit at the seed fair will encourage friendly rivalry in

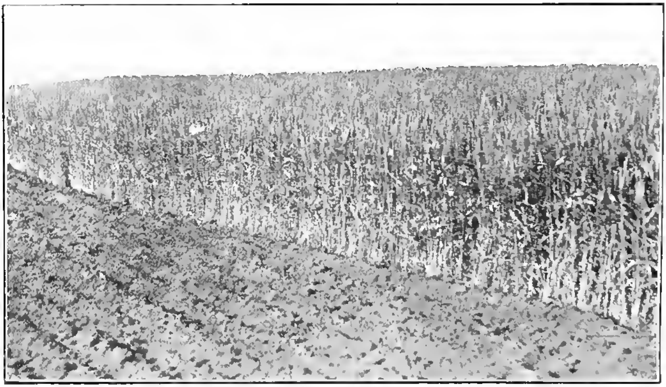


Fig. 77.—Field of Red Bobs Wheat, 1917.

the competitions and that means better crops, cleaner crops, cleaner farms, better farms, cleaner and better grain of higher quality and grade.

Nor is this any mere theory. It is intensely practical, and every individual grain grower should realize the possibilities within his reach. He should make some effort to encourage the seed grain fair, to make it a success, not merely with the object of winning a prize—although this is a worthy object and there must be some inducements offered—but of winning much more than the mere prize offered at the fair; he will win in the increased profits from increased yields. While not every-

body can win the highest standing at the fair, all have the opportunity of doing so.

Fairs are largely educational, both in the showing of the different exhibits and in the exchange of ideas. The judges sent out are men who can discuss with the producer some of the problems which he has met on the farm. Many a farmer will go away, feeling that the time spent in attending the seed grain fair was well spent. The success of the fair rests largely with the individual farmer.

At the larger Provincial Seed Grain Fairs the number and quality of the exhibits usually are excellent. Here there is a greater opportunity still to dispose of seed grain on exhibition. Men from the different parts of the Province meet here and profit by what they see and hear.

Let us be practical. You may have 25 bushels or 2,500 bushels of excellent seed grain to offer for sale; but unless its value is widely known as excellent seed grain it occupies the same status as commercial grain. But place it where it may be seen and recognized according to its merits and it can be disposed of to good advantage, shouldering aside the ordinary run of seed which ought to have no place on the farm.

At the local summer or fall fairs, and also at the larger industrial exhibitions held in the summer, the number of grain exhibits are very few. Visitors from widely scattered districts meet at these fairs and go away impressed by what they have seen, favorably or unfavorably. Invariably the grain exhibit is small and insignificant, compared to the rest of the show, when it ought to be a very prominent display in quantity and quality. The manufacturer of all kinds of machinery does not

keep his goods in his workshop or warehouse; he brings them to the fair, at considerable expense, so that all may see the machinery in operation; he brings it to the probable purchaser. Why doesn't the grain grower do likewise?

The Large International Fairs

Greater importance is attached to the larger international fairs, where the exhibits on display come from widely representative states and countries, and where only exhibits of the highest quality can obtain a high standing. The visitors from different countries here are impressed by what they see; the chief interest centres upon those exhibits which have been awarded first prizes and sweepstakes. The visitors go away impressed by the quality of the exhibits, and the men who grew them and the district where they were grown. Only the man who has grown an exhibit that obtains this high standard at the local seed fair and the larger Provincial Seed Fair has a chance to win a high place at the International Fair. It has often been stated that Seager Wheeler put Rosthern on the map. Well, probably so. But if he had not taken any trouble to grow pedigreed seed grain and put it on exhibition Rosthern would be a little spot somewhere near the Arctic Circle. All names look alike on the map.

The importance of grain fairs should not be overlooked, therefore. The prize awarded may be insignificant; but not so the value of the seed grain and the advertising which it will bring to district or province. The fair boards should encourage the grain grower just as the grain grower should encourage the fair. The fair is what the farmer makes it, and there is no question that

in his own interests the producer should make some effort to ensure the success of his fair.

There is a starting-point to everything. In the matter of seed grain it lies in the first outlay for a bushel or so of the best seed obtainable for foundation stock to multiply and increase for the needs of the farm, the surplus for seed purposes. This seed has the best opportunity of winning the highest awards at those events where it will be advertised to the direct benefit of the grower.

In passing, I may say that at five of the International Fairs my wheat which won sweepstakes was pedigreed seed in every instance—pedigreed seed of the first generation, taken from the multiplying fields.

The great importance attached to growing prize grain is that it eliminates inferior seed and thereby raises the standard of our grain to a higher eminence.

CHAPTER XXIX

PREPARING EXHIBITS

One should have some idea as to what is essential to obtain a high score in preparing exhibits for exhibition at any fair—local fair, seed fair or the larger International Fair. Only one exhibitor can win the highest prize, and that prize goes to the best exhibit. Many an exhibit that looked good before it was placed in competition may look weak when lined up alongside the rival exhibits. It is well to bear in mind constantly that there are tens of thousands of other men who are growing grain, and while only a few of these may compete, there is always the possibility that someone else has grain as good or better than one's own.

I have often been asked whether I am going to win more big prizes. There is only one answer to such a question: "Who can tell?" One cannot determine if the sample promises to be good or otherwise while the crop is growing, but must wait until it has reached maturity. Even then one cannot be sure, as weather influences may decide the question at the last.

An exhibit may consist of the threshed grain or of the sheaf. Firstly, everything depends upon the merits of the samples to be exhibited. With respect to the threshed sample it is very essential that only pure seed

of the highest quality be sown; where the seed can be traced to the progeny of one single selected plant the sample will be uniform in color, size and contour of the grain. Only when the variety is pure can these results be obtained. Ordinary seed is a mixture of races and strains, and the situation is aggravated when there is a mixture of varieties. Such samples cannot be expected to score high. The judges may overlook an otherwise good sample in favor of one that is pure and true to type and uniform. This is particularly true at seed grain fairs. It would be well for every intending exhibitor to consider these points carefully and profit therefrom.

Preparing Wheat Exhibits

In preparing an exhibit of wheat the first thing to do is to decide whether the sample is worth exhibiting. The color is to be considered, the size, the shape and uniformity in shape. The color should be bright, clear, translucent, free from starchy or piebald or frosted or rusted grains, free from smut and weathering. The next thing to do is to clean it by mechanical means—the fanning mill cleaner or grader—to remove dust, chaff, straw, weed seeds, light and immature grains and the small grains. When cleaned the exhibit should be placed in a clean, new sack, as this adds to the value of the exhibit.

A whole lot depends upon the way the exhibit is prepared. Acting as judge at many seed fairs, I have found that not always did the best sample of grain secure the highest place; some other exhibit, while not as good in plumpness or even in color, scored higher because it was more uniform in type, free from weed seeds and impurities. The better looking exhibit fell down on some point or other, such as smut, trace of weed seeds, etc.

Preparing Sheaf Exhibits

In preparing sheaf exhibits we would consider the quality of the grain in the head, the type of head, its size and shape, the straw's color and general appearance

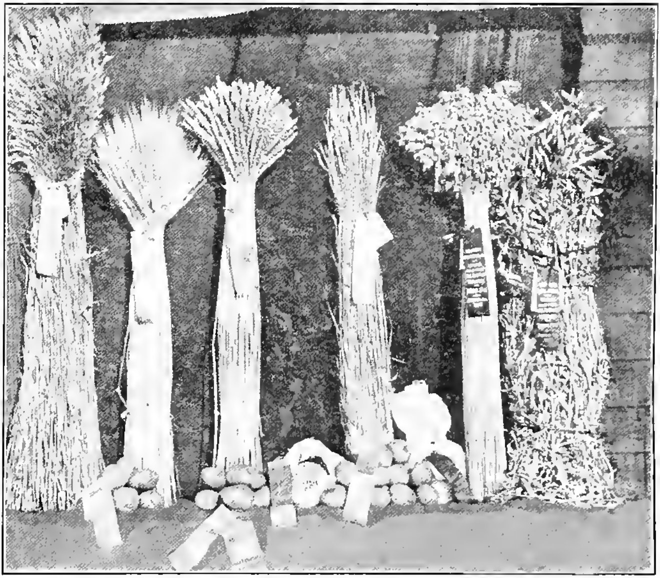


Fig. 78.—Seager Wheeler's Prize-winning Exhibits, Peoria, Ill., 1917.

Sheaves, left to right—Brome Grass, Canadian Thorpe Barley, Red Bobs Wheat, Western Rye Grass, Victory Oats and Arthur Peas. Potatoes—Early Ohio and Gold Nugget.

and the arrangement of the sheaf. The time to gather the material for the sheaf is just before it is fully ripe, while there is still a slight green shade on the head; if one is in doubt, then it is best to leave it until it has turned a ripe color, but not until dead ripe. If gathered

too green the heads and grain will have a shrivelled appearance. They should be cut while dry, and at no time while damp or wet with rain or dew.

It is best to cut the full length of the straw, just above the ground, and assemble in bundles of about 100, tied lightly at the middle, but more firmly again at the butt so that the sheaves can be hung, heads downward. They should be hung in a dry, airy, dark place to cure, and left there until dry enough to strip the covering from the stems. If they become so dry and brittle that they break easily, the stripping can be done on a damp day when the stems will be less brittle.

The size of the sheaf depends upon what is called for. The best shaped sheaf is made when about four inches in diameter just below the heads. Sometimes a six-inch sheaf is called for; but this is bulky and it is more trouble to make a nice neat sheaf of that size. For wheat sheaves it will require about 400 stems to make a sheaf of four-inch diameter; about 500 for oats, and the same for barley. Some allowance must be made for breakages, and an extra few gathered from which to draw repairs.

The sheaf should be made with the heads in a circular bush and as neatly as possible. For tying the sheaf the best material is baby-ribbon, about half an inch wide. If wider than that it detracts from the appearance of the sheaf. Do not tie with string, binder twine or rags. Do not tie any fancy bows or rosettes or choose too bright or fancy a color. The judges will judge the sheaf, not the fancy ribbons or bows; in fact, these may influence the judges to the disappointment of the exhibitor. The color of the tie should match the straw, and while it should be neat it should not be so attractive as to take attention from the grain.

The sheaf should be tied just below the head to keep the heads from straggling, again at the butt and one or more further ties between these two.

In selecting the heads make them as uniform as possible in size—large, without being coarse and open in the head. Sometimes large heads are found on the outside of the fields; but these usually are coarse, and the quality of the grain poor for the reason that they do not develop. Better to choose smaller heads, but those which are uniform in size—in short, nice, large, normal heads, true to type and variety.

CHAPTER XXX

The Canadian Seed Growers' Association and the Experimental Farms

The amount of seed wheat, oats and barley required for seed purposes in the Prairie Provinces may be fairly estimated at 43 million bushels.

The average yields per acre for the three Provinces may be set at 19 bushels for wheat, 38 to 40 bushels for oats, and 30 bushels for barley. Many individual farms grow an average crop of 25 to 30 bushels of wheat per acre, 60 to 100 bushels of oats, and 40 to 50 bushels of barley.

There is no doubt that this wide difference in yield is due largely to inferior seed. The situation may be improved vastly by the use of a higher quality of seed, obtained by plant breeding and seed selection. Although the Canadian Seed Growers' Association observes such essentials of crop raising as soil fertility, improved methods of cultivation and crop rotation and prevention of injury by weeds, insects and plant diseases, it is in the use of better seed that the Association is directly interested.

To find proof that the quality of our seed in common use is much inferior to what it should be it is only necessary to visit the average Canadian farm at seeding time

and examine the contents of the grain drill. The average farmer has not had the proper appreciation of the part

Fig. 79.—Among the Head Row Plots.

played by the seed itself in determining the yield and quality of our crops.

The Work of the Association

The work of the Canadian Seed Growers' Association is closely allied with that of the Government Experimental Farms. As the reader is aware, the Experimental Farms conduct original research with field crops, test different varieties of grain obtained from different parts of the world, and through breeding and selection try to evolve strains of particular quality for growing on Canadian farms. The Experimental Farms, of course, are not in a position to control the multiplication and distribution of these sorts in a large way among individual farmers;

if that were attempted, the greater part would quickly lose identity and be ruined by lack of proper care in maintaining the purity. The conservation of improved stocks, therefore, their judicious multiplication and distribution on a large scale under efficient control is a main aim of the Canadian Seed Growers' Association.

The Association works in close co-operation with the Seed Branch of the Dominion Department of Agriculture, the district representatives of the Seed Branch doing most of the field and commercial seed inspection. The important work of the Association is recognized by the Government, which provides the necessary funds annually.

The Association assumed its present name in 1904. Prior to that date it was known as the "Macdonald Robertson Seed Growers' Association," which was organized following "The Macdonald Seed Grain Competition"—a competition in seed growing which began in 1900, and for three years extended over the entire Dominion. The object was to stimulate an interest in the production and selection of high-class seed by providing visible demonstrations as to the practical advantages of using such seed. About 1,500 competitors took part.

Membership of the Association

The Canadian Seed Growers' Association is made up of farmer members who want to make a specialty of growing on their own farms high-class seed of one or more kinds of crop under expert direction, thereby creating a supply base for pure seed of high quality. This seed is multiplied under the Association's inspection and control and made available to the general farming public for seeding purposes.

There are two kinds of members — Honorary and Active. Any person of good repute is eligible for membership as an active member, providing he conforms to the by-laws and regulations of the Association. Before being elected an active member in good standing, each

Fig. 80.—Kitchener Wheat Growing from Hand Selections.

applicant is required to make a hand-selection of seed in sufficient quantity to enable him to sow a hand-selected seed plot of the required size the following year. Also, where practicable, his work must be inspected and commended by an approved officer of the Association. No membership fee is asked for at present. Applications for admittance to membership should be addressed as follows: *Secretary, Canadian Seed Growers' Association, Ottawa, Canada.*

The officers of the Association consist of a President, three Vice-Presidents, a Secretary-Treasurer, an Execu-

tive Council, and a Board of Directors, 20 in number. The Directors are elected annually from the different Provinces of Canada in order that the work may be of a national character and far-reaching in its influence.

An Active Secretary

Much encouragement to members in their work has been given by L. H. Newman, Secretary of the Association. Some 12 years ago he wrote to me in reference to taking up the work of hand selection of seed grain. At that time little was known about this work, nor was anything published to assist one along these lines. I was then working along a dim path of my own in an effort to improve the crops I was growing. The system followed by the members of the Canadian Seed Growers' Association appealed to me as worth while and I gladly sent in my name for membership.

At that time I was growing Preston wheat, Ligowo oats and Canadian Thorpe barley. At first I took up only wheat for hand selection, following later with oats, barley and potatoes.

I have a very pleasant recollection of Mr. Newman's first visit to my farm to inspect the crop I then had under selection. The seed plot was already cut and in stook. I was anxious to get some information as to the most desirable type of plant to select, and we sat down by a stook and there I had my first real lesson in seed selection.

The importance of types and the wide difference between different types I grasped readily. From that time forward I began to make progress. I had a clear object in view and soon got some intimate knowledge of the different characters or types and varieties. Since then

I have considerably improved the varieties at that time under selection; but dropped them whenever more suitable varieties took their places. I have not forgotten the lesson learned that day with Mr. Newman, and it has been productive of good results.

The sincere worker who is willing to pay the price in devotion to his work, in patient labor and painstaking

Fig. 81.—Field of Kitchener Wheat Yielding 80 Bushels per Acre, 1915.

effort, will find the officials of the Canadian Seed Growers' Association ever willing to lend the helping hand.

The Experimental Farms

The farmers of Canada are greatly in the debt of the Government Experimental Farms for the work which is being accomplished in the interest of the agriculturist. The first to be established was the Central Experimental Farm at Ottawa, in 1887. On his appointment as Direc-

tor of this farm Dr. William Saunders realized the need for varieties of wheat which would be more suitable to the Prairie Provinces than those then being grown. From other countries with similar seasons and climate to those of Western Canada he gathered samples of wheat—some from Russia and Siberia, some from the mountainous districts of Northern India. All these different lots were grown on plots at Ottawa and many found to be of no particular value.

One of the most promising was Ladoga wheat. Its superiority lay in its early ripening, but it proved inferior for milling and baking qualities. Some cross-breeding was done and resulted in Preston, Stanley, Huron and some other hybrid wheats. Preston, Stanley and Huron were improvements upon Ladoga wheat, and all of these were sent out to the Prairie Provinces and to the different branch experimental farms which had been established. Some of these wheats at one time were grown largely in preference to Red Fife because of their earlier ripening and larger yielding qualities; their inferior milling qualities, however, failed to place them on an equal plane with Red Fife.

The Work of Dr. Charles Saunders

In the early nineties the science of plant breeding was not so well known as at the present time. In 1903 Dr. Charles Saunders, a son of the Director, was appointed Cerealist at Ottawa, his chief work to be the improvement of grain crops. It was through the efforts of Dr. Charles Saunders that Marquis wheat was introduced all over Canada. The Dominion, especially the Prairie Provinces, has good reason to be proud of Dr. Charles Saunders; for his is the triumph of Marquis wheat. By his

keen perception and experience in plant breeding he isolated from among a lot of unnamed hybrid wheats one that indicated high milling qualities, earliness and high yield and sent it out under the name "Marquis." Its superiority over Red Fife was quickly demonstrated

Fig. 82.—Harvesting Head Row Plots.

and it has very largely replaced Red Fife. Wherever Marquis wheat is grown Dr. Charles Saunders will be remembered; but for his efforts Marquis might have been lost for all time or never discovered at all.

He has brought out several other wheats which give promise, especially in point of earliness, a vital point in the Prairie Provinces. I might mention Prelude, Pioneer and Ruby; the last is one of his latest and not yet well known.

It is not the purpose of this book to go into details of the work that is being done by the Experimental Farms.

Only a passing reference can be made to this important work. During the past thirty years, or more, samples of grain, potatoes and some other crops have been sent out to the farmers each season. Some 30 years ago it was that I received a small lot of Beauty of Hebron potatoes and Canadian Thorpe barley from the Ottawa Experimental Farm. These are still being grown on my farm. Red Fife, Preston, Bobs, Prelude wheat, some oats and Brome grass—these are a few of the different lots I have had and which I have grown carefully and only dropped upon discovery of some more suitable variety. They all played a part on my farm. I am still growing Brome grass from the original seed sent me.

The theory that grains, potatoes and some other crops will deteriorate or run out is exploded in my case, as to-day the crops growing on my farm from the original seed sent me by the Experimental Farm so many years ago are better than when they were first received. They degenerate or run out only when given careless treatment by continuous growing under adverse conditions of soil preparation and by failing to keep up the purity.

Samples Should Receive Careful Treatment

It is to be regretted that many of the samples of grains and potatoes sent out to farmers by the Experimental Farm have not received the careful treatment they deserved. There are some well-known instances where the grain has been fed to poultry instead of being sown, and the potatoes used on the table. There would be less waste and loss of this valuable material if every farmer fully realized the amount of patience, care and labor they cost and the years that it takes to bring them to a high state of perfection before they are sufficientaly increased to

supply the needs of all who apply for them and who can reap the most benefit from them. I do not say that those farmers who misused their opportunities did so wilfully; it is more charitable to believe that such foolishness was due to ignorance or want of thought. One naturally recalls the Biblical reference to "casting pearls before swine"; for such waste is a crime.

I wonder just how many do realize the time it takes first to create, then improve this seed before it is sent out for distribution. It is a life's work! Because this valuable—this priceless material comes from a Government source is no excusable reason for regarding it lightly. These samples are created to replace inferior stock to the direct benefit of the individual farmer as well as the farmer as a whole. It is nursery seed and it goes through a severe testing before it can be considered worthy to take a place on the farms throughout the country. Those who have raised this potent seed material have not spent a few hours, a few days or a few weeks or months at the work, but it has taken them years to raise it to a high standard. What a disappointment, therefore, it must be to know that sometimes it is wasted or allowed to slide down again to the degree of mixed varieties and inferior stock!

The best plots or fields on the farm are none too good for this seed. See that it gets such consideration. Expend some effort to keep it up to the high standard of excellence and purity that is entrusted to your care. Increase it, and away with your inferior stock!

There is need for closer co-operation between the farmer in general and the Experimental Farms, the Agricultural Colleges and the Canadian Seed Growers' Association. When this is realized by the farmers them-

selves these institutions will receive their due reward in the recognition of good service done, and the farmers will receive a direct benefit in increased profits which will follow the use of improved seed as surely as day

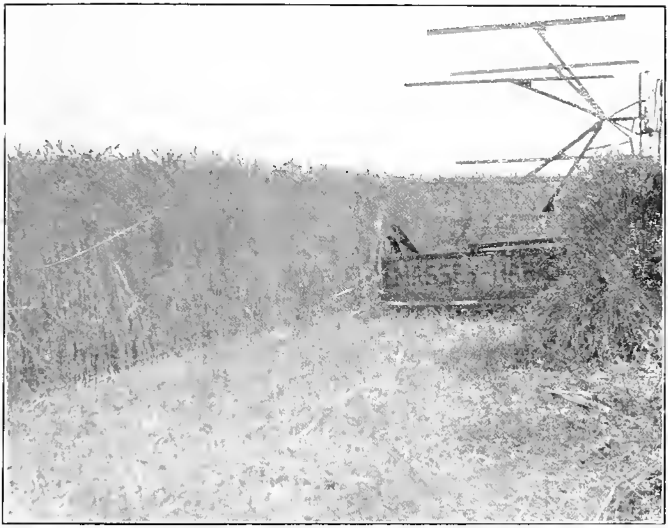


Fig. 83.—Marquis Wheat which Won the Sweepstakes at Wichita, 1914.

follows night. That way lies the betterment of agriculture.

Professor Bracken

It was stated recently by one of the foremost authorities on agriculture that Saskatchewan was very fortunate in having the services of Professor John Bracken, of the Field Husbandry Department of the Saskatchewan University farm, as he was the most capable man in his

line of work in Western Canada. At any rate, having had some acquaintance with him for some years past and with the work that he is doing I can say that I have found him at all times very courteous, very ready to co-operate with anyone who is searching for light on many farm problems. Professor Bracken has the unique reputation of being very conservative in his statements and in the advice which he gives to farmers. While theory is all right in its way, there must be proof of it in actual field practice before he will make a definite statement as to any course to be pursued.

In a Province like Saskatchewan, where the conditions of soil and season are variable, this careful policy of Professor Bracken has led to the axiom: "What Bracken says, goes." Under his direction experiments are being conducted at the present time which are sure to be of genuine benefit to the farmers of the West. This work is planned not for the present only, but for the future. Future generations will reap benefit from it perhaps to a greater degree than can we to-day; but there is much to be learned even for present benefits. His work, according to a system laid down by himself, consists not alone of crop rotation, but embraces all phases of grain production under practically every possible condition. The system is too elaborate for explanation here in detail; but the results are going to be definite and far-reaching. From time to time information regarding some of these will be published, and all concerned in crop production in Western Canada will find such information of practical value.

The Bracken system is found nowhere else in such completeness, even elaborateness, of detail. Professor Bracken has drawn up his plan in a manner which leaves

one portion of land sown each season to wheat, oats, barley, flax, rye and other grains, forage and root crops, and these are at different stages from the first breaking up of the prairie sod, backsetting, plowing at different depths, and dates, etc.

But the briefest of references is possibe here to this important work, and the work of the Experimental Farms and Agricultural Colleges in the past. All the Agricultural Colleges in Manitoba, Alberta, etc., are doing good work, as is also the Canadian Seed Growers' Association. The personal references to men engaged in this work are no reflection upon the many others who are accomplishing results faithfully and well; those I have mentioned are men with whom I have come into cooperation in my own efforts on my own farm, and I am indebted to them in no small way for their painstaking assistance and sincere encouragement.

CHAPTER XXXI

Advertising and Marketing Seed Grain

When I wrote the first heading for this chapter I placed it "Marketing and Advertising," because when one first thinks of selling, the question of marketing naturally arises before anything else. Inasmuch, however, as advertising of some kind must precede marketing, I have changed the heading to "Advertising and Marketing," and will, therefore, discuss the subject in this order.

Advertising a Necessity

If a person wishes to make a success of selling good seed grain he cannot escape advertising of one kind or another. The trouble is that the idea of advertising is usually confined to newspaper advertising. The production of good seed and getting a reputation for doing this is just as much a part of advertising as the use of the newspaper ad. So, too, is the giving of service in connection with your sales and seeing that each customer is a satisfied customer. If one looks at the subject in this way he sees the commonly accepted meaning of advertising (newspaper advertising) as a part of the whole scheme of selling. It may be said, however, that it is a most important part.

A man may produce registered, selected or otherwise choice seed grain, but without the aid of advertising he cannot dispose of it to the best advantage. The very best seed grain in the bin has no more value than commercial grain unless people get it to multiply and improve their crops. All the trouble and effort that has been expended to improve it will bring in no cash return unless people learn of it. And how shall they learn of it unless by advertising? This advertising may only consist of word-of-mouth recommendations of neighbors who have seen what this seed will do: This process is slow and tedious, however, and, from a business standpoint, the most expensive kind of advertising, since so long a time must elapse before sufficient people hear of the grain to make a really worth-while market. The next less expensive step is by letter writing or direct mail methods, as it is technically known. To the average farmer this is practically impossible, however, partly because the average farmer is not a proficient writer of sales letters (and they need to be well done in these busy times to get any attention at all), and partly because he has no list of names to send them to. Experience has shown that the sending of letters to people, many of whom may not be interested in buying, is a most expensive way of advertising.

Economical Advertising

This brings us to the real kernel of the idea in advertising seed grain, and that is that no form of advertising can be at once so economical and so efficient as what we term newspaper advertising. A paper can insert a good advertisement for less money than it would take to send a personal letter to one per cent. of its subscribers. You

will not get replies from even one per cent. of the readers of the paper, but neither would you get replies from a large per cent, of those you might send a general letter to. The advantage you have in this, however, is that the replies you get from newspaper advertising represent the "cream" of over one hundred times as many people as the same money spent in a letter would reach. Every one of their replies represents a likely prospect for your grain. To every one of them you can afford to send a good letter, because, on the average, a man doesn't reply to an advertisement unless he "means business". In your advertising don't be astounded if you receive many more replies than you expected, for that frequently happens. On the other hand, don't be disappointed if the number does not come up to your expectations. If as many men came to your farm to personally inspect your grain as will reply to your advertisement, you would feel more than satisfied. Regard each enquiry as a prospect. Treat it just as thoroughly and courteously as you would the writer in person. Try, in your correspondence, to make that person really want your grain, and you will succeed beyond your fondest dreams.

Farm Paper Advertising

In advertising seed grain through newspapers there is undoubtedly no class of papers so much to be depended on as the farm papers. In fact, one might say that this is the only class of papers which need be considered. This is true for three reasons. In the first place, farm papers naturally go only to farmers. Farmers are the people they are published for, and the only people they appeal to. That means that your advertisement is not

going to (and you are not being charged for the sending it to) a class of people who would not be interested in your grain, no matter how good it is. For you must know that a paper's advertising rate is in proportion to its circulation. The more subscribers it has the more you pay. In the second place, farm papers usually go

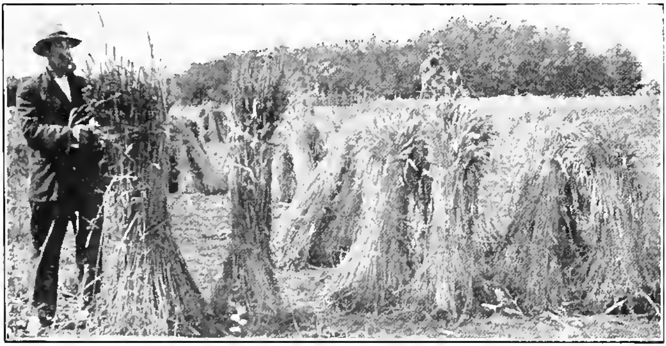


Fig. 84.—Harvesting Grain Grown under C. S. G. A. Rules.

to the best farmers. Farm papers are naturally progressive. They go to farmers that are seeking to better their conditions. That means that your advertising in farm papers not only goes to prospective customers of yours, but to the best class among these. In the third place, farm papers are continually urging the use of better seed. This know this is an important subject to every farmer, and one that will be read with interest by all their readers. This means that in addition to placing your advertisement before the very best farmers they are urging them to investigate and use the very thing you have for sale.

When one gets right down to the position of using advertising space in a farm paper, the very practical point arises—how much must or should I spend? Since there are two kinds of advertising that can be used in farm papers, and since each kind has its own peculiar use and cost, it may be advisable to discuss the question of cost under these two heads.

Classified Advertising

Classified (or condensed advertising, as it is sometimes called) is a very effective means of advertising where one has only a small amount of grain to sell, and cannot afford to use "display"—a word which is explained in the next section. In classified advertising the advertisements are all set up in uniform, condensed type, without illustration, and those of one kind placed together. This explains, you see, the application of the words "classified" and "condensed" to this kind of advertising.

The cost of classified advertising is usually reckoned at so much a word. Each initial letter usually counts as a word. Figures, when set in numerals, as $2.00, may be counted as one word, or the number of words they would take if spelled out (as, Two Dollars). This depends on the paper. Full particulars concerning the classified rates in any paper are usually given on the page with the classified advertisements. In sending in classified advertisements it is better to send a little too much money than not enough. If there is a balance the paper will return it to you. If the amount is short, however, the advertisement is usually not inserted till the balance is sent, which may keep it out of one or two issues that would prove very valuable at that season.

For the benefit of those who do not know, it may be said that this practice of demanding "cash with order" is no reflection on any person's honesty. The very small profit on each classified advertisement does not permit of the opening of charge accounts, and the resulting expense of invoicing, sending statements, etc.

In writing classified advertisements the object should be to state the particulars in a plain, clear manner, and in the fewest possible number of words. On the other hand, do not leave out any word of explanation that is needed. Many a classified advertisement has failed because of the omission of a word or two that might have changed the reader's general interest to personal desire. Your advertisement should make the reader either want your grain or want to know about it before he buys elsewhere. If you are in doubt about how to write your advertisement send full particulars to the paper and ask them to write it out for you in the least possible space.

Display Advertising

Display advertising differs from classified advertising in that the reading matter is not condensed. Blank space is used in the advertisement to make it prominent. Large headlines are used to attract the eye of the reader, and pictures may be put in for the same purpose, as well as to illustrate certain points difficult to express clearly in words. Many advertisers feel that classified advertising appeals only to the small purchaser, whereas display advertising appeals to the large buyers. There is considerable evidence on both sides. Some advertisers use both—the display at intervals (missing an issue or

two between each advertisement), and classified advertisements in the intervening issues. In this way they get the attention of both classes, if such classes there be. Display advertisements cost more than classified, but where a person has sufficient grain to sell to warrant the expenditure of $25 or more they often bring decisive results more quickly than the classified. Unless a very special bargain is offered, the use of only one display advertisement is not recommended. It may produce the results, but the use of three or four advertisements is more certain, as one advertisement in one issue may not be read by the very people who would buy. By running in three or four issues, however, the chances of success are more than trebled.

The cost of display advertising is based on the agate line—the unit of measurement in this class of advertising. An agate line is a line one column wide and one-fourteenth of an inch in depth. That is, there are 14 agate lines to a "column inch"—a space one column wide and one inch deep. If the display advertising rate in a paper is 50 cents an agate line, the cost of a column inch would be (50 x 14) $7.00. The utmost amount of matter that could ordinarily be put in this space would be about ten lines of about eight words a line, or eighty words. This does not leave any room for display. A safe rule to follow is to allow about 75 words to every inch, and then add from one-third to one-half as much space more for "display". If you do not know how to display the advertisement send the matter in to the paper and tell them to attend to this for you. Unless you are a regular advertiser with the paper it is better to send your money with the advertisement, so that no delay may occur in getting the advertisement in.

Handling Correspondence

Of equal importance to advertising is the proper attention to correspondence from interested parties. There are a few main points that are essential. Be prompt. Your enquirer's interest is aroused when he writes. Do not let this wane. Get your reply back to him by return

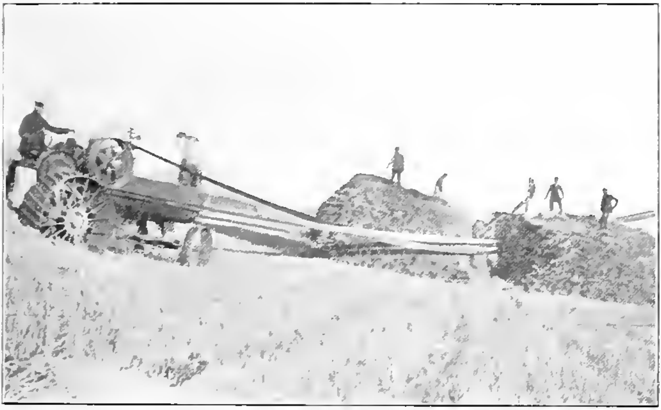


Fig. 85.—Custom Threshing on a Prairie Farm.

of mail if possible. He may have written others besides you, and may accept the first good offer he gets. Be explicit. See that you have answered all his questions, or all that you might ask if you were in his place. Write as you would talk if you were selling him the grain. Quote prices, terms, etc., so clearly he cannot misunderstand. This often prevents trouble later.

If a person has much correspondence it may pay to have a letterhead printed. Besides looking more busi-

nesslike, it saves writing and prevents mistakes in addresses. If your farm is named it might be well to make this a part of the letterhead.

Marketing

After you have done your advertising, attended to your correspondence and secured your orders, the question of sending out your grain still remains to be done. Do not use the cheapest sacks you can get hold of. They tear easily in transit, and the purchaser is disappointed. He would rather pay a few cents more and receive his grain in good condition, and, besides, he can use good strong sacks on the farm, while cheap, thin sacks are of no use to him or to you. Good strong jute sacks are as good as cotton. A 14-ounce sack will do for wheat, 12-ounce for oats or barley. Use good binder twine in tying the sacks. Make the tie long enough to give several turns around the mouth of the sack. Binder twine grips the sacking tightly, and is therefore better than smooth twine. In case of registered seed, where the sacks are inspected and sealed, finer twine may be used to attach the seal, but a second tie should be made with binder twine. Always bear in mind that seed grain sent by freight travels by way freight. It may have alongside it in the car all manner of junk, machinery, etc., that may rub against the sacks and tear them. In placing the sacks in the car stack them up neatly and securely.

It is a good plan to acknowledge your customer's order. He knows then that you have received it and accepted it. You should also notify him when it is being shipped, so that he can take care of it as soon as it arrives. In case of dissatisfaction with shipment, try to handle the complaint promptly, courteously, and always in the

spirit of fairness. If your customer seems "hot", do not reply in the same tone. He was probably excited when he wrote his letter, and has had a chance to "cool off" since. Remember that the most successful business men make a point of always satisfying their customers, even though the individual transaction may be a loss to them at the time. It pays in the long run. If, in answering complaints, you put yourself in the other man's place and treat him fairly, you will usually find him willing to meet you half way, no matter how strongly he wrote in complaining.

FINIS.

International Twine

Service and Quality

TWINE and twine satisfaction are two mighty big factors in the annual harvesting of Canada's grain. The troubles and labors of harvest time are great enough at best—see that twine does not add to your dificulties.

We urge that you rely on the complete dependability of **Deering** and **McCormick** twine. Twine bearing tags with either of these two names is the most economical you can buy, not the cheapest perhaps—though this is open to argument. A thing that is cheap is not always economical. Poor twine seldom works satisfactorily. Farmers who use it lose valuable time trying to ajust the binder to handle it and blame the binder for their trouble, when the brittle short-fibered, irregular twine they are using is the cause of it all.

Deering and **McCormick** twine has both quality and uniformity and it averages above the guaranteed lengths. This matter of length affects the cost of twine seriously. Suppose your "cheap" twine runs 50 feet short to the pound—as it is quite likely to do. On a 50 pound bale, that means enough twine to tie 1200 bundles of grain.

Our sixteen branch houses and the transfer houses in Canada each season carry stocks totaling millions of pounds of **Deering** and **McCormick** twine to meet demands. Harvester twine service—timely and efficient—has actually saved Canadian grain growers hundreds of thousands of dollars.

The **Deering** and **McCormick** tag and the years of good farm machine building experience back of it, is positive assurance that you are getting the utmost in twine value to be found to-day. The price you pay is the lowest at which satisfactory twine can be produced and sold